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ENERGY AND WATER DEVELOPMENT APPROPRIATIONS FOR 1996

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Energy and Water Development Approp...

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BEFORE A

SUBCOMMITTEE OF THE

COMMITTEE ON APPROPRIATIONS

HOUSE OF REPRESENTATIVES

ONE HUNDRED FOURTH CONGRESS

FIRST SESSION

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1995

SUBCOMMITTEE ON ENERGY AND WATER DEVELOPMENT

JOHN T. MYERS, Indiana, *Chairman*

HAROLD ROGERS, Kentucky
JOE KNOLLENBERG, Michigan
FRANK RIGGS, California
RODNEY P. FRELINGHUYSEN, New Jersey
JIM BUNN, Oregon

TOM BEVILL, Alabama
VIC FAZIO, California
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NOTE: Under Committee Rules, Mr. Livingston, as Chairman of the Full Committee, and Mr. Obey, as Ranking Minority Member of the Full Committee, are authorized to sit as Members of all Subcommittees.

JAMES D. OGSBURY, BOB SCHMIDT, and JEANNE WILSON, *Staff Assistants*

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- **Galvin Report** 945

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ENERGY AND WATER DEVELOPMENT APPROPRIATIONS FOR FISCAL YEAR 1996

TUESDAY, MARCH 7, 1995.

DEPARTMENT OF ENERGY

WITNESSES

HAZEL R. O'LEARY, SECRETARY, U.S. DEPARTMENT OF ENERGY
JOSEPH F. VIVONA, CHIEF FINANCIAL OFFICER
ELIZABETH E. SMEDLEY, CONTROLLER

OPENING REMARKS

Mr. MYERS. The committee will come to order. Madam Secretary, we are pleased to welcome you once again before our committee to present the Department of Energy's request for a budget this year. I emphasize request. Mrs. Smedley, good to see you back again. You have all your associates here. Your prepared statement will be placed in the record, and you may proceed as you care.

Secretary O'LEARY. Thank you. Mr. Chairman, first of all, I want to thank the committee for this opportunity to testify on our fiscal year 1996 budget request. I would ask for the record that you accept an addendum sheet which is intended to replace paragraph 3 on page 2 of my formal statement. That paragraph discusses a vulnerability to oil imports and upon reading it very late last night, I found it was somewhat sanguine with respect to the increasing imports of oil and more importantly, refined petroleum products as well. So with your permission, I would like this more carefully worded——

Mr. MYERS. Without objection.

FISCAL YEAR 1996 BUDGET REQUEST

Secretary O'LEARY. Thank you very kindly.

Mr. Chairman and members of the committee, I know that there are several general issues in which this committee has deep interest, and I would like to start discussing what I believe is perhaps the most important to the committee. As you well know, our request for fiscal year 1996 is 4 percent greater than it was in the prior fiscal year. Many have asked, and I thought I might as well attack it directly, why in this time of budget stringency would the Department of Energy, which is now committed to bring down its budget dramatically over the five years succeeding this fiscal year, be seeking an increase.

Quite frankly, I would describe it much in the way a corporate organization prepares for downsizing. The delta in this budget is approximately $300 million. $200 million of it represents the cost to fund the severance payment of some 12,000 contractor employees who will be going off of our rolls this year. That is a one-time only cost, and we believe important to achieving the long-term savings that we have projected over the next five years.

Another additional element in this budget really speaks to new starts in program areas in the national security and defense budget line. As you well know, last year and the year before, the President instructed the Department of Energy to continue our informal moratoria on testing while we went forward, first of all, to seek ratification of the extension of the Comprehensive Test Ban Treaty, and as well as, I am sorry, the extension of the Nuclear Nonproliferation Treaty.

In those areas, we have significant scientific proxies for testing which have a cost. Principal in this budget you will find support for the National Ignition Facility, which now permits us to be in a position over some years to certify the safety and reliability of the stockpile without testing.

Some other initiatives in our budget in that area of scientific stockpile stewardship also account for budget increases. The other area where there is a large increase, and I thought I may as well put this on the table as well, is a $100 million initiative which is a Presidential initiative to permit more private sector, and university users to get at some of our advanced basic science user facilities. That has been a capstone in the President's initiative to keep technology driving the competitive edge of the United States of America.

Those represent the budget increases, but I want to be clear on the fact that as we begin the effort to relook our triparty agreements among the States and EPA where we have agreements for cleanup of our weapons sites, we will begin to accomplish the savings that we have indicated.

ANTICIPATED COST SAVINGS

Another area where we will accomplish savings is in our applied science and technology area, where I now have asked Dan Yergin to head a task force of private sector entrepreneurs as well as people who have used our applied science and technology in the Department of Energy to take a hard look at how we are structured and whether or not the funds that we are expending really do represent a market pull.

I know it would be much easier to go in and simply slash the budget, but I thought we ought to give a very careful and thoughtful approach to this when one recognizes that it is the science and technology, especially the high-risk applied technology that will drive economic competitiveness, and help us to really combat this problem of increasing energy needs. That completes my oral testimony and I very much look forward to answering the questions that this committee will have.

[The prepared statement of Secretary O'Leary appears at the end of the hearing record.]

CONTRACT REFORM COST SAVINGS

Mr. MYERS. You have allowed us a lot of time, Madam Secretary. I imagine we will use it.

Secretary O'LEARY. I have learned it is best, Mr. Chairman.

Mr. MYERS. Well, I just came from hearings with the Air Force MILCON, military construction, and they have gone in their request for construction of housing, for other facilities at Air Force bases, from about a billion dollars in 1994, down this year for 1996 a request less than half that.

Now, you have been going the other way. Now, you have given three reasons this morning, at least three reasons why you had to go up, but in your first paragraph of your prepared statement you say—you describe DOE's transition to a smaller, more effective and more efficient enterprise. If we had kept it big, it wouldn't have cost us this much, would it?

Secretary O'LEARY. I have been doing that, Mr. Chairman. Recognizing in the two years and under two months that we have been in the job, we have already not only identified, but brought to the bottom line over $2 billion worth of savings. I haven't waited for anybody to tell me to do that, I have simply done it.

You may recall the trajectory of this budget when we arrived. It was going up, up and away, and what we have managed over the past two years is to bring it down. We have accomplished significant savings in contract reform, also in freezing salaries, contractor salaries, simply because when we came in and took a look at what the market was paying across the United States, we recognized that our salaried employees who work under contract to us were well above the market. We have already bagged those savings and more importantly, we have committed beyond this transition year to producing more savings out of the Department of Energy than any other cabinet agency or department within the executive branch. So I am very proud of what we have accomplished, and I recognize the need in this transition year to very carefully position ourselves so we can go forward.

One might suggest that one of the areas where we could have accomplished some savings was to withdraw funding from the Environmental Management Program. All that does is set us up for lawsuits with States that have existing compliance agreements with us that will permit them to sue us if we do not meet our milestones. I recognize that those milestones now need to be renegotiated, but they do not need to be renegotiated in a climate where we are not hitting milestones and we are being sued. That is a greater cost to the American taxpayer.

We, just two days ago, sent instructions out to the field regarding how our field commanders, if you will, will begin the work at renegotiating the 71 conpliance agreements which will permit us to now bring the savings which we have quantified to be over $4 billion in the Environmental Management Program over the next five years. But that can't be done by simply slashing budgets without getting the assent of the Governors and the regulators in the States where we have existing agreements.

DOWNSIZING CONTRACTOR SUPPORT

Mr. MYERS. Well, of the three statements you made this morning why it was increased, let's take a look at the first one, the severance of contractors. Does that mean that you had to pay contractors to buy their contract back? Was that a mitigation agreement that you worked out with the contractors or an offset? Did we abrogate some contracts?

Secretary O'LEARY. No, there is existing language in union contracts for which the Department has responsibility when there is downsizing. There is a kind of severance pay that one expects in any contractual relationship where one agrees to come on board. And, as you may recall, we have been severing employees rather steadily in the two years that I have been here.

This is a very dramatic downsizing this year with some 19,000 employees which accounts for the fact that the severance pay number is larger than $200 million. But that will be a significant savings. We have cut contractor rolls by some 12 percent over two years, and we will bring it down to 21 percent by the time we have come to the end of this five-year period. This is a large number of people coming off the rolls, and I might tell you if you were sitting in my chair, you would understand that we have made no one happy other than those of us here. I suspect if the committee membership grows broadly enough in the time that I am testifying, I will hear some unhappiness from people on this committee as well.

Mr. MYERS. I am not through yet.

Secretary O'LEARY. I know you are not through.

Mr. MYERS. That was one of my questions. I have probably used my five minutes. If we change seats here, if you were sitting over here, would you be pleased with this? Wouldn't you question about—last year you promised us you were going to come down.

Secretary O'LEARY. And last year I did come down, and the year before that I came down.

Mr. MYERS. This reduced your ambition, it looks to me a little bit.

Secretary O'LEARY. Dramatically, Mr. Chairman.

STOCKPILE STEWARDSHIP

Mr. MYERS. I didn't know what your ambition was at that time, but I guess I know now. The second leg of your three-legged stool here that you have presented, the nonproliferation which involves our testing, our nuclear weapons for security for reliability, stability, and NIF, is that a crucial part of that testing?

Secretary O'LEARY. The National Ignition Facility, in my mind, is one of five very crucial scientific proxies for testing that get us out of the testing business. I have wrestled with the issue of whether or not the Department could and should afford this proxy. As I began to understand that as a Nation our policy was going to lead us to the Comprehensive Test Ban Treaty, it became apparent that that would be a driver. But more importantly, my principal, the President of the United States of America, directed me to establish a scientific-based proxy for testing so that we would no longer have to detonate nuclear weapons. In that regard I have met the President's requirements through the establishment of this very sophisticated technology which would permit us now to understand, without exploding fissile material, whether or not the weapons in the remaining stockpile are both safe and reliable. I think that that is a very important and necessary initiative if we are to continue to provide the kind of leadership that will permit us to, within my lifetime, be free of nuclear weapons, and I believe it is a very serious and necessary piece.

Mr. MYERS. I hope you are right on that last statement, but—we have some other questions. We will go one round here, five minutes each.

Mr. Bevill.

NUCLEAR WASTE STORAGE

Mr. BEVILL. Thank you, Mr. Chairman. Madam Secretary, we are always pleased to hear your presentation.

Secretary O'LEARY. Thank you, Mr. Bevill.

Mr. BEVILL. You had a very brief statement this morning, I noticed. I thought that was interesting. But, you know, the Chairman and the members of this panel for some time, we have been concerned about the storage and final disposition of the nuclear waste, the highly radioactive waste and the wastes from our nuclear power plants that are filling up their storage capacity, while paying dues, paying fees into the government to have storage. They can't get the storage and their fees are being used for other purposes, not by you, but by the government, and so it is a rather frustrating situation in all fairness.

When I was a country lawyer, I was always suing the Alabama Power Company. I loved to sue them because they could pay off, so don't think that I am trying to be a champion of the utilities. But I do believe in fairness and you do, too, and it would seem that there would be some way here that we could take care of the waste situation with all the fees that are being collected.

What did we put in there, $6 billion last year for nuclear waste cleanup? I don't know, of course, what we will do this year. What is it you are seeking this time, how much, do you recall?

Secretary O'LEARY. Yes, sir, I do. Approximately one hundred and, I want to say, twenty on budget—and $431 million off budget, and the reason——

Mr. BEVILL. One hundred twenty what?

Secretary O'LEARY. I am sorry?

Mr. BEVILL. One hundred twenty?

Secretary O'LEARY. $198 million on the budget.

Mr. BEVILL. You mean that is all?

Secretary O'LEARY. What we are seeking to do this year, Mr. Bevill——

Mr. BEVILL. Oh, you are talking about Yucca Mountain. Go right ahead.

Secretary O'LEARY. Yes, did I misunderstand you?

Mr. BEVILL. I was talking about the whole waste program, but that is okay. You go right ahead. We will just talk about Yucca Mountain. That is a good one to talk about.

Secretary O'LEARY. Fair enough. What we are seeking to do this year is actually reach into the Nuclear Waste Fund and get funds which are equivalent to the nuclear funds that those commissioners within the States that have nuclear power would like to see us begin to use so that we can continue to stay on the course that we have plotted for ourselves. We want to be able to certify whether we can or cannot use the Yucca Mountain site as a geologic repository. GAO and our own Inspector General have told us this year that if we are not able to get at funds to adequately continue the scientific and technical work that we call characterization, that is working within the mountain to understand its geologic constraints, then we will not meet our milestone to inform our regulators and the public generally whether or not Yucca can be used as the ultimate repository.

WASTE STORAGE LEGISLATION

Mr. BEVILL. You know, the only way that will ever be built will be for legislation, regardless of the General Accounting Office, regardless of the Department, with environment, regardless of any government agency, regardless of any law heretofore made. This bill, this project will be completed, and expedited, and I think that is sort of what the Bennett Johnston bill, authorizing bill hints at, isn't it?

Secretary O'LEARY. That is true. There is a bill before the Senate.

Mr. BEVILL. Then, also I might add Representative Upton has the same bill, I understand, in the House.

Secretary O'LEARY. Yes, Mr. Bevill, there are several pieces of legislation. I have, as a matter of fact, testified late last week on that legislation, and I want to share with this committee that we are in agreement to the fact that there needs to be legislation that does several things.

First of all, permit, now, an interim facility because it is clear to me now that the authorization for the Nuclear Waste Negotiator has lapsed. There is no one working on those initiatives, and you may recall that the Secretary of Energy, since 1989, has had no authority to work on an interim facility. We would like that authority as quickly as possible. But we would like that authority not to exacerbate any progress that can be and should be made on the long-term storage facility. I have also testified to say that I believe that the Secretary of Energy also ought to have some authority to develop a contingency plan presuming, but not clearly yet understanding whether or not we, on the completion of the characterization of Yucca Mountain, will be able to go forward with that initiative as well. So I have testified extensively on that legislation.

We have also raised the question, and some concern, that some of the attempts to sweep away regulatory requirements around public participation and adherence to environmental standards we are not exceptionally comfortable with, but in general we like the thrust of the legislation that has been introduced on the Senate side, and I am——

Mr. BEVILL. So in general you support the Johnston and the Upton legislation?

Secretary O'LEARY. Well, the Upton legislation is a little more difficult for me to support because it does not go as far as I would like to see it go.

Mr. BEVILL. But the concept, you support that?

Secretary O'LEARY. Yes, sir, but I want to be clear on this. What the Upton legislation does is it gives legal title to the waste to the Secretary of Energy. As I have testified before Mr. Upton, that doesn't help me for the long term, because I have got title, but I can't put the stuff in my pockets and take it home with me.

INTERIM WASTE STORAGE

Mr. BEVILL. Without picking on it, the intent is to build an interim storage facility?

Secretary O'LEARY. I would like that authority very much, Mr. Bevill.

Mr. BEVILL. You would support that?

Secretary O'LEARY. I do support that.

Mr. BEVILL. You would be in favor of taking the shortcuts to get it done?

Secretary O'LEARY. No, sir. I am not in favor of taking shortcuts, and with your permission——

Mr. BEVILL. You want to wait for this certificate and that certificate, and years from now you can say, well, I finally got that last certificate?

Secretary O'LEARY. Let me tell you why I believe it is important, Mr. Bevill. I spend time with individuals who are living near these sites. I used to work in the utility industry, and I am well aware of the fact that citizens have to have some level of comfort with respect to the regulatory review that gives them a level of comfort with respect to their safety and their health and the protection to the environment. Without delving deeply into the standards described in what we are now calling the Bennett Johnston legislation, they go far apace for me.

Mr. BEVILL. Don't you think you and your Department could be responsible on seeing to it that it is built safely or do you have to have several agencies to get certificates for you?

Secretary O'LEARY. I would say this, Mr. Bevill, that in my experience it has been proven to me that I do a much better job when someone provides oversight and, more now than ever, I am finding that it is external oversight which people prefer. But I believe that that oversight can be expedient, and it ought to embrace risk-benefit analyses that are technically based, that don't drag on forever, and don't take me into court if I haven't gone through all of the correct loops. So, where there is disagreement, it is in how you weave that tapestry so that it accomplishes the goals that the public wants and the goals that we want.

Mr. BEVILL. My time is about up, and I will come back to it later, but I don't think anybody wants an unsafe facility, but we are talking about storage out there in the middle of the desert. The only place on earth, the only place on earth you could find, there is no place in the world you could find more suitable. And they are out there studying rocks and they are studying water, and they are going to be studying it 10 years from now, and you are going to be waiting on a certificate from this agency and that agency, and, you know, I think the Department of Energy is getting pretty sophisticated and pretty knowledgeable. It seems to me that you all would be capable of seeing that it is done right.

France built one, you have heard me say this before, but I was impressed with their thousand-year storage facility over there, just a concrete floor and a tin building and all the tubes look like the torpedoes we used in World War II and stored there, glassified.

I asked somebody the other day why can't we do just what France has done to have a thousand-year storage. We could use that. I think we ought to have both. I realize you can't just build one, you can't build a temporary, it will become permanent, and you can't build a permanent, because you can't get a temporary, so that is where you are. Do both.

Secretary O'LEARY. I agree, and I want to.

Mr. BEVILL. Have a concrete floor out there like Oak Ridge has had for 50 years, no harm has been done. I have seen them, they are sitting right there, those tubes. That would handle it temporarily, and do you agree that that could be done in the desert out there in Nevada?

Secretary O'LEARY. Yes, sir. There is an above-ground spent fuel facility just at Surry in Virginia that belongs to VEPCO. It is very near my hometown.

Mr. BEVILL. So it is nothing new. The utilities in the country are filling up; they have a crisis. I have used all my time right now, and I will come back. Thank you, Mr. Chairman.

Mr. MYERS. Well, thank you. It is a very important issue you are talking about there, though. There is a risk, but there is a tremendous risk leaving these rods where they are today with the utilities, too, it seems to me.

Mr. Frelinghuysen.

FISCAL YEAR 1996 BUDGET INCREASES

Mr. FRELINGHUYSEN. Thank you, Mr. Chairman. Sorry to be a little bit late, but I did catch the gist of your questions and I would like to follow up on those with the Secretary. Good morning.

Secretary O'LEARY. Good morning.

Mr. FRELINGHUYSEN. You said on page 6 of your prepared statement, and I quote, "We realize that in acting in response to congressional and administration initiatives, we are facing a budget that would be out of control within a few years. Our fiscal year 1996 budget halts this trend. It is a launching pad for a steady decrease over the next few years towards the cost-effective achievement of our missions."

How does your budget actually halt the trend? From what I can gather, your budget has gone up by approximately $866 million over the previous fiscal year's budget.

Secretary O'LEARY. Well, in point of fact, the way I measure the trend is from the five-year projection that I found for the Department of Energy when I arrived. In the two years that we have been in the job, any increase that we have received has actually come from unexpended funds from previous years.

The Department of Energy has every year taken a cut with OMB. This is the one year that we have not, in the two years that I have been here. The way the budgets are reported, the unexpended amount that we have been allowed to use, we have. As a matter of fact, some of my colleagues have laughed at me because I very willingly have taken a cut each of the past two years.

This year we have not, and as I explained before you got here, one of the major reasons is to begin new initiatives on the national defense and nonproliferation side as well as to pay for severance of some 19,000 employees in our Environmental Management program who are going off of our rolls as we begin to downsize those programs.

The other initiative in my budget which accounts for the increase is a Presidential initiative, which I fully support, which would permit the further usage of our basic science facilities, much like the Tokamak facility when it is up and open. It contemplates full use of our facilities in the basic science and high energy physics side. That represents, in my view, the very important driver that technology has become not only to deploying applied technology to solve energy problems, but to solve the problems of industry. I can talk to great degree if someone is interested, because I have just recently come from China and India where we have been selling U.S. products in expanding markets, which I believe is very important to jobs here in the United States.

TOKAMAK FUSION TEST REACTOR

Mr. FRELINGHUYSEN. Can you talk about the Tokamak Fusion Test Reactor for a minute in terms of what significance the results have been in this power development?

Secretary O'LEARY. Well, for those of us who have been in the business for 20 years, more often than not we have talked about fusion energy as something that would pay off some time in the future.

Last year, we had dramatic results at the Tokamak when, on budget and ahead of schedule, the facility showed that it could produce and generate 10 million watts of power, well exceeding what had been promised and committed to. What that test phase did, and we repeated pulsing where we actually beat our goal for producing power, what we did was we proved out the engineering concepts for fusion power.

The next step is to go forward and build a larger facility which would be a demonstration size plant, which moves us very close to a future of the use of fusion power to replace some of the fossil fuel that we are using today.

What remains and why the budget for the Tokamak Physics Experiment is not expanded, some will say thank goodness, but has not expanded as one would expect it to, is that we are now in a period of review and also determination within our administration as to whether or not we will continue to go it alone with Tokamak, which is not our preference, but how and under what circumstance the larger international efforts combine to produce fusion energy might be orchestrated. At the end of this review in late spring we will have answers which will affect the way we formulate our fiscal year 1997 budget. I must say that in doing that I am recognizing as we go forward with the Tokamak that it would be my responsibility to find offsetting costs in some other area. I am committed to this project, as I believe it offers hope for the 21st Century.

Mr. FRELINGHUYSEN. How does our project compare to what the Japanese and the Europeans are doing in terms of their investments?

Secretary O'LEARY. Well, up until this year we have met all of our international commitments in terms of investment. I am unable to, with any detail, tell you whether we are spending more or less than the Japanese. I can tell you we are spending a great deal more than the Russians who haven't spent anything this year and have told us that they are unable to. The European Community is the other partner, but I can provide for the record the information with respect to the comparisons between what we are spending and what is being spent both in Japan and the European Community.

But suffice it to say that we have met all of our commitments under our international accord. At issue now is how we go forward with the management structure, and I can get into some detail about that if you would like.

[The information follows:]

FUSION ENERGY

We now estimate that the European fusion program funding, which has just recently been approved by the European Parliament and the member countries, totals about $600 million equivalent U.S. dollars. The Japanese budget for their next fiscal year, beginning in April 1995, appears to contain as much as $500 million equivalent U.S. dollars for fusion research. These funding levels will allow the Europeans and the Japanese to maintain fully comprehensive fusion programs. The U.S. program, which has requested $366 million for fiscal year 1996, no longer has a standalone fusion development program. The United States depends principally on results shared with us by our international partners in several areas, such as the development of alternative approaches to fusion, and certain areas of fusion technology.

FUSION ENERGY

Mr. FRELINGHUYSEN. In terms of the overall long-term needs of our country, energy needs, where does fusion fit into the picture?

Secretary O'LEARY. Fusion, in my mind, holds out great promise for the 21st Century. I have been in and out of this business now for more than 20 years. It has always held out a great promise. Last year was the first year when we had a glimmer of delivery on that promise, and I am, along with people in the physics community who are degreed—I am quick to point out that I am not—very hopeful. I clearly understand that we must continue to support these efforts. I am most comfortable supporting them in an international compact because it is a very expensive endeavor.

Mr. FRELINGHUYSEN. It is expensive. The taxpayers, have they gotten their money's worth from our investment to date?

Secretary O'LEARY. That is a very difficult conversation to have because generally the taxpayer looks for an immediate benefit, and the immediate benefit is not yet apparent. That is always the case in basic science, when you invest for the long term and the payoff is generally, you know, well advanced into the lifetime of most people who are watching this. But in my opinion, understanding the energy needs of the 21st Century, this is a technology which we must continue to support.

Mr. FRELINGHUYSEN. But in terms of where it fits into the overall picture, what percentage of our energy needs are going to be provided in the long-term picture?

Secretary O'LEARY. Well, I am very timid to get into this discussion because I have been in it in the 1970s and the early 1980s. One now focuses on what the requirements are going to be in fossil energy, and I have learned it is probably best not to deal with those projections for the long term because it never turned out to be quite correct. The focus in my mind has always been at least into the mid 1980s to focus on clean, reliable, sustainable energy, and that is what fusion offers, and in many ways it is far more attractive than the fossil energy that we are using today.

Mr. FRELINGHUYSEN. I am not sure that is a direct answer, but I guess about as far as we are going to get. Thank you very much. Thank you, Mr. Chairman.

Mr. MYERS. Thank you, Rod.

Mr. Fazio.

INTERNATIONAL MARKETING EFFORTS

Mr. FAZIO. Mr. Chairman, there are a number of questions I wanted to get at, but first I wanted to welcome you back from Asia and congratulate you for the aggressive effort that you and others in this administration make to market American products. Can you give us just a 30-second report on your success on this trip?

Secretary O'LEARY. I can, and I would say it is success shared very broadly, by not only people in this room, but other senior people in our administration. I was in India. It is the second time this year that I have been to India. As I understand it, I am the first cabinet officer who has ever returned to India. That returning visit and Ron Brown's visit, as well as the visit of Minister Salve to the United States, and almost monthly exchanges between our senior people and senior people in the Indian government at both the central and the State level has resulted in $10 billion worth of sustainable energy development projects, either signed in contract or memoranda of understanding.

In my mind, the more important piece, however, is laying in the infrastructure working with the Indians, I will talk about China in a bit, to ensure that these agreements entered into are actually financed because the real measure of these energy projects is not how many billions of dollars worth of contracts we sign, but how many actually go to financial closing, receive letter of credit so that we are actually building facilities in these nations.

I would quickly state to you that India and China represent 50 percent of the world's population, and their demand for energy as they seek to grow and expand economically is tremendous. Some of us have quantified that in less than 10 years what is required in those two nations alone is in excess of $3 billion.

India and China, because we have worked with them in science and technology, have a clear understanding that the United States has both the technological edge and we have the management edge because we have been in those countries as managers and contractors. There is an opportunity here for seeding high-paying, high-value jobs in the United States and perhaps most importantly, that is, ensuring that this is the cleanest technology possible.

The U.S. taxpayer and businesses have invested in that technology. We ought to be seeding it and more importantly, it is very necessary to stabilize the economic climate in Asia so that we can stabilize our interchange and exchange within that continent and between our three or four nations. On a national security level, I believe this is a very important endeavor as well.

ELIMINATE CABINET AGENCIES

Mr. FAZIO. Sure. I appreciate the emphasis you place on it. I think it is a high priority and I think totally in keeping with the administration's emphasis on exports, domestic job creation, and, hopefully, some international stability as a result.

I wanted to ask you about the headline in this morning's Congressional Daily. My friend, John Kasich, throws his weight behind the killing of cabinet agencies, and he is my friend, I might add, although we don't agree on everything, you might say. But John says he is joining a group of freshmen Republican Members in doing away with the Energy Department. He said it may still have some legitimate functions, but those duties could be transferred elsewhere.

He added that the Federal Government should establish a commission charged with closing the various laboratories operated by DOE. He goes on to say if the departments are eliminated, he wants to ensure their employees are not simply transferred to whatever department assumes their functions. He said, though, that employees should be able to transfer if they fit under established employment caps at the agencies.

I just thought I ought to give you an opportunity to respond to that proposal. It comes from a very important member of the Republican leadership, who is charged with—regardless of whether we have an amendment in place or even circulating through the States—the job of getting our deficit to zero by the year 2002, a job that I assume that he is going to bring to the Floor some time in April. You have an opportunity to respond.

Secretary O'LEARY. Thank you, Mr. Fazio.

I would start by saying that I have addressed this issue not by arguing that the Department of Energy should be spared. Rather, I have asked the question: what are the functions and do the functions represent governmental activities that are important? I understand especially from those who viewed the Department in the 1980s when there was the last attempt to dismantle or close it down, that the focus, then, had been on a very large portfolio having to do with regulating the energy industry.

Why do I know this? Because I used to have that job. The budget and the mission of the Department of Energy has never been that exclusively. In point of fact, even during the 1980s its mission was on the national defense side as the provider of the nuclear weapons that helped us win the Cold War. So I would start by examining the missions. The defense mission, in my opinion, since 1947, people wiser and more experienced both politically and in matters involving intelligence than I, have always been clear on the need to separate the responsibility for the reliability and safety of the nuclear weapons stockpile away from the military.

The first person who espoused that thesis was President Truman, and it has been embraced by every Administration since, by no more illustrious persons than the following Presidents and Jim Schlesinger and Bill Perry among those who were part of the last report.

CONTROL OVER THE WEAPONS STOCKPILE

Mr. FAZIO. Dr. Teller just did it before this committee a couple weeks ago.

Secretary O'LEARY. I am happy to hear that he did. I believe through the experience I have had in the Department of Energy, which has been one of respect, but not always agreement between my colleagues in the Defense Department and the military, that there needs to be the civilian control of the weapons stockpile.

IMPORTANCE OF THE LABORATORIES

With respect to the expanded work we are doing in nonproliferation, I would now move over to the mission that has to do with science and technology, of which our larger labs form the complement. The expertise in nonproliferation, weapons design, parallel computing, materials management and the requirements for advancing the sophistication of our materials and also our technology generally resides in the 10 largest national labs, of which the Department of Energy has responsibility.

I could not see in the short term simply walking away from these laboratories. I have talked about the work that we have done in China. A good deal of that work comes out of the national laboratories and is seeded much as Mr. Frelinghuysen has asked about Tokamak, over 20, 40, 47 years, the results that we are now seeing, much of that done in bomb design.

I believe, and take to heart, the work from the Galvin Commission that says that we can run these labs in a much more business-like way. I believe the laboratories can do their work in a much more business-like way. Galvin says we can perhaps find 30 to 40 percent in savings by simply managing them better. I believe that the 20 percent to 30 percent is right on target. After that, we need to look at how to reduce our mission.

ENVIRONMENTAL MANAGEMENT PROGRAM

Finally, I need to talk about the Environmental Management Program. There are many who have said that this program can stand alone. Stand alone or stand with itself. It needs to be better managed and we have proved we have done and can do it by sucking out $2 billion in the last two years of costs projected for this program, and not always doing it with a great deal of comfort and succor from the States who worry that we don't do our work because they equate the money we spend with how well we clean up.

If one examines the functions, the clear answer to the question is the functions must exist. Now what I would ask people to do is examine the management skill applied within the Department of Energy within the last two years and if there is someone that can do it better, then they ought to come and do it.

I would say to you that I believe we have done not only a credible job, but we have brought business practices into the Department of Energy that permit us to have offered up $14.1 billion over the next five years which no other cabinet agency has ever done.

Mr. FAZIO. Mr. Chairman, I don't know whether I have any more time for this round.

Mr. MYERS. Well, we will come back.

Mr. FAZIO. I think Jeanne said that is about it. If she thinks I don't deserve another life saver, my feelings will be hurt, so I will pass.

RESCISSIONS

Mr. MYERS. We will take 10 minutes the second round since there are only four of us.

Madam Secretary, I was concerned about what I thought was a rather modest rescission that we had to implement a few weeks ago, but I am holding here a couple of press releases and one letter from Deputy Secretary White quite critical of our decision.

As an example, we did reduce by $15 million the Biological and Environmental Research Program, which last year we increased it by $29 million, and we just took half of that. Another proposal, $154 million of that funding was unobligated, including $122 million of unobligated operating expenses, yet the explanation given to us, you are going to cut a couple projects, the construction of one which has already been obligated. I just don't understand.

Then the laboratory technology transfer you are going to cut $8 million out of the cooperative agreements between States and small businesses, and $9 million hasn't been obligated, you said that would hurt. Environmental cleanup, we just took $145 million out of a $6 billion plus last year, which over the past five years we have put $23 billion in the environmental management.

This year you are requesting more than $7 billion, and of that you have $2 billion still unobligated this year, and then Mr. Grumbly says, Assistant Secretary Grumbly said, you are going to cut 18,000 employees out of the environmental management. We have increased it already up to $6 billion. Why would you have to cut 18,000 people out? Why do you cut some of the programs you are being as there is unobligated funds there?

Secretary O'LEARY. There will always be disagreement between the committee and the Department with respect to where the cuts are applied when rescissions are requested. You know, one would expect that kind of difference of opinion, but I think it is more important to go to the issue not on what we have identified in a very quick turnaround as opportunities and targets for cutting, but I believe it is more important to discuss the larger program which is the Environmental Management Program. It is very difficult for us to hold faith with the States when they see that we are not or believe that we cannot meet agreed-to milestones for which budgetary requirements are not only articulated, but are known and agreed to.

Each step of the way at each one of these sites there is a clear understanding and expectation about what shall be done and what it would cost. When we are visited with requests and when we are visited with rescissions, we have to focus in two ways. Can we continue to meet these milestones, and more often than not there are two ways to have it. The Department is a very labor-intensive operation. We have these national laboratories which have facilities, but the bigger part of our budget on the contractor side, quite frankly, goes to employees, so we have these options.

You let people go or you discontinue the technology which leads to cleanup, and that is a no-brainer for most of us, to look at. How we can manage with fewer people, but not withdraw the technology because it is the technology that permits us to actually accomplish the cleanup. Otherwise we are simply moving waste and dirt from place to place, but it is the technology which must be preserved, and at the same time we must preserve enough people in the work to get that done, but we are the department who says—we say we are going down. We have a plan to go down, and that is the way we would have to apply those rescissions. I expect there to be strong disagreement in the way we approach that.

Mr. MYERS. Well, I don't think any of us are trying to micromanage the Department of Energy. We don't have the talent and the capability, but we do have to question when the cuts are made here. As an example, the 18,000 employees, when we are going to cut $145 million out of a $2 billion unobligated balance this year, why would you have to cut 18,000 people? I have to quickly figure out what those people are paid. They are pretty well paid.

Secretary O'LEARY. I can tell you exactly how well they are paid. On average their salary approaches approximately $100,000 fully loaded, and I would point out to you, understand that we are already going down 12,000, so that is an increase 6,000 over the 12,000.

GALVIN REPORT

Mr. MYERS. Well, the Galvin report has been mentioned. Somebody mentioned it a moment ago. We have had some hearings, kind of oversight hearings and everyone has been extremely critical of the environmental management fund, that we are not getting the job done.

Can you explain to us why it is not being done, why everyone is critical? Bob Galvin sat right there and was extremely critical.

Secretary O'LEARY. I testified with Bob Galvin last week. I cannot believe that he was extremely critical. I understand——

Mr. MYERS. Well, he sure wasn't complimentary.

Secretary O'LEARY. I understand that he read the language from the report on the Environmental Management program, and I have this to say, one individual in that task force wrote the report. He and Bob Galvin recognized the grist for his mill was the General Accounting Office data which took a snapshot of the program before I or Tom Grumbly ever came into it. I want to be clear that on the milestones established for the program since I have been managing the Environmental Management program, it has met its milestones—met them and beat them last year, and we expect to do the same thing this year. But it is clear that we now have to rework these milestones, given the fact that the budget request for 1995, it appears, is well on its way to rescission.

The areas where there is great quarrel on the part of the individual who examined the Environmental Management program for the task force have to do with how the budgets spent for science and technology and cleanup are spread among the private sector laboratories and universities. The quarrel, as I understand it, after having read the full report and after having discussed this with our lab directors who would also like a larger piece of that pie, as they all see it growing, is that Mr. Grumbly's position has been, "Yes, I want the best technology, but I want it at the least cost," and at the moment the laboratory is not the least cost provider for the science and technology that we desire.

I recognize that I own some of that as Secretary of Energy, and what we have been working to do and I have charged Mr. Grumbly to do, and he has done quite successfully, is reduce the cost for his science and technology and cleanup generally because we came into the job understanding that we were paying anywhere from 20 to 35 percent more for cleanup than people in the private sector were paying.

At the same time, we have a corner on the market as the largest environmental management and restoration operation in the world, so we have addressed that by reducing those costs 10 percent in fiscal year 1994, and I believe we will hit 10 percent this year.

Now, at the same time, there are laboratories who want a piece of that work, but they have got to be cost-effective to do that work. Therein, in my opinion, lies some of the conflict that represents itself in that portion of the report, and I clearly understand it, but I am standing on the day the Galvin report was made public to focus on the great effort that Mr. Grumbly and his people have made to both rationalize that program and to clearly understand the vulnerabilities on sites which were not known or understood to us as a matter of centralized planning and policy setting when we came into the job because no one had done the work. So I am defending these individuals who took a program badly managed, whose funding had been raised dramatically every year since 1988, but had no good business practices. We are getting there. Now is there room for improvement? You bet. But I think we have done a great job and we have got more to do.

ADMINISTRATIVE COSTS FOR CLEANUP WORK

Mr. MYERS. Well, certainly more to do, I agree with that, but if administrative costs for this management or lack of management are running 40 percent, is that good business practices?

Secretary O'LEARY. I am telling you that that is the way we found it and that we are correcting it.

Mr. MYERS. That is what he said it still is, that is what the report said.

Secretary O'LEARY. That is not true. The GAO report that was used as the foundation piece for that examination took a snapshot in the Bush administration when a gentleman named Duffy ran the program. The first thing we did was come in and take a look at that because I had to understand how costs were out of control and how to get them in control, and that is one of the management accomplishments that Grumbly has made in the last fiscal year and is making this year.

Mr. MYERS. Well, if the Bush administration was doing such a poor job and you are doing such a good job, why do you need more money? With efficiency within the system, the existing money will get more bang for the buck.

Secretary O'LEARY. Because, Mr. Chairman, the program and its needs and its requirements continue to grow. I need to point out to you, and I know I have done this before, but I must do it again.

When we arrived, no one had quantified the vulnerabilities for the most hazardous things on site. No vulnerability study for plutonium, for spent fuel or for hazardous wastes when I arrived. We were cleaning up simply toxic waste and not going after the worst because no one had ever quantified it.

We now know what is on these sites, and I am finding myself in a better position when the phone rings at 2:00 in the morning because I am not wondering now as I did every night whether something is going boom in the night in Hanford or Rocky Flats or Pantex because we now know the vulnerabilities and they are being addressed in a management plan. That was not the case when I arrived.

PRIORITIZING CLEANUP

Mr. MYERS. We have had several witnesses say that—I will paraphrase it—you are chasing the wrong rabbit, that some of the things that you are doing aren't near as dangerous as you are putting them, prioritizing them too high. Do you think that is a fair accusation? Obviously you don't.

Secretary O'LEARY. I agree the wrong rabbit was being chased when we arrived. Sir, I have been here two years, and I will tell you that it took me a year to get a handle on this stuff. It took me another 18 months from the first year to even take a snapshot at the vulnerabilities.

I have been working and Mr. Grumbly has been working day and night to renegotiate these agreements which are focused on the wrong things. These are contractual arrangements which have to be gone in and renegotiated. We are doing this at a fair pace, and I will sit here until the cows come home and defend the way we have managed this program and anybody who comes behind me will tell you that we can do a better job, and I agree.

I am the person who came into the Department and said let's do a little quality management here, which means you improve every day. So I expect you to expect more from me, but I am delivering to milestones every month as are my Assistant Secretaries delivering to milestones. There were no milestones when I arrived.

Mr. MYERS. Thank you.

Mr. Bevill.

INTERIM WASTE STORAGE

Mr. BEVILL. Thank you, Mr. Chairman. Madam Secretary, getting back to the nuclear waste crisis that is facing the country, if you do get the authorizing legislation, if Congress passes it, authorizing an interim storage facility, say out there in the area of the Yucca Mountain site, would that—how long would it take you, then, to get one in operation? Do you have any judgment on that?

Secretary O'LEARY. I do have a judgment. I must say that much of this depends on whether or not we do our required regulatory work well enough to stay protected from a lawsuit, and I say that as a lawyer with a great deal of clear understanding how people can intervene.

Mr. BEVILL. Well, with your clear, knowledgeable experience, would you have any judgment as to how long the lawsuits and the certificates and all would take if you get the authorization and the legislation that I gathered that you support?

Secretary O'LEARY. I can tell you that in my experience, depending upon the venue and depending upon the regulatory requirement, one can, as you have cited in the case of France, practically put one up in six months. I know of a pad that is going up in New Jersey that will go a lot faster than that. The VEPCO project went very quickly. I would expect that we ought to be able to do this in two years.

What I would rather do is see the legislation fully developed, and we will engage as we are working with both the House and the Senate to develop this legislation in a relationship as we are doing it, but clearly in my mind this ought to be a 24 to 36-month endeavor, and that is going to be very hard to do, but I believe that that is what we ought to be reaching for.

Mr. BEVILL. But you are saying actually if everything just works fine, you get the certificates, you get through the lawsuits, you get through with all these things you go through, it could be done in 24 months?

Secretary O'LEARY. I would hope, sir. I will likely want to come back and refine that as our knowledge is better informed.

POWER MARKETING ADMINISTRATION PRIVATIZATION

Mr. BEVILL. Yes. Now, one other thing. You had mentioned in your written testimony that the original purpose of the power marketing administrations have been achieved and that their functions should now be conducted by non-Federal entities.

Secretary O'LEARY. Yes, sir.

Mr. BEVILL. You also mentioned that the DOE's proposal for the sale of the PMAs will provide customers protection from significant rate increases.

The first question I would like to ask you is what is a significant rate increase? This is a concern we have about this. You know, we have the fat cats out there ready to grab these things, buy them and then start raising the rates. It turns out to be a pretty hard deal for the consumer.

Secretary O'LEARY. I understand.

Mr. BEVILL. So you are very wise in pointing out that without any significant rate increases, but that gets into the question of what is a significant rate increase.

Secretary O'LEARY. Well, sir, in my experience almost any rate increase to the consumer of power is significant, but more carefully in an economic analysis of same, one would hope to keep rate increases at the rate of the gross domestic product or of the State domestic product. As we have talked and received instruction from the President as we go forward to work out a legislative approach, I have been clear in understanding that rates have to be kept well below 5 percent, and I believe that Bill White, our Deputy Secretary, who is on point for this assignment has been grappling with that figure, along with Robert Nordhaus, our General Counsel, and what we have been discussing with some of our colleagues is at or below the 5 percent mark.

Mr. BEVILL. Do you have any judgment as to how long it will be before the administration submits a bill authorizing you to do this?

Secretary O'LEARY. Mr. Bevill, I must apologize because I have been back now a week and a day, and I have not looked at the timetable for the negotiation within our administration. I will promise to do that before close of business today and I will communicate that to this committee. I apologize for not being able to answer that.

Mr. BEVILL. I commend you on your trip. Everything I heard about it was very good and apparently you did a great job. Would you just furnish that for the record then?

Secretary O'LEARY. I will be delighted to and I will do it today.

[The information follows:]

PMA AUTHORIZATION LEGISLATION

Privatizing the PMAs will be a very complex transaction that will require considerable study and very close consultation with Congress, PMA customers, affected communities and others. The Administration plans to send up a general bill in the near future directing the study of PMA privatization. This will allow the necessary detailed studies to be performed in order to develop final legislation. Such legislation, which may consist of several discrete pieces and take months to develop, will be provided to the Congress later this year.

Mr. BEVILL. Mr. Chairman, I have many other questions here I am going to submit for the Secretary to answer. Thank you.

Mr. MYERS. Thank you, Tom.

Mr. Frelinghuysen.

DEPARTMENT OF ENERGY OVERSIGHT

Mr. FRELINGHUYSEN. Thank you, Mr. Chairman. Madam Secretary, how many rules and regulations do you promulgate during the course of a year?

Secretary O'LEARY. It would be difficult for me to tell you, but I only promulgate those rules and regulations that are generally required by the law. I see approximately 10 to 12 in a month, but I want you to be clear on the fact that I see few of them.

Most of the rules or regulations that we submit to the Office of Management and Budget we are required to submit, resulting from the Administrative Procedure Act and generally language in the authorizing legislation that tells us how to regulate a program resulting from legislation. The area where I have a greater concern, quite frankly, has to do with those directives coming out of the Department which focus on the work that is done by our contractors, and when I came to the job I recognized that we had too many. They were very confusing, they were redundant and often conflicting. In the last year, not the first year, Mr. Chairman, that I got into the job, I recognized that we needed to approach that issue as well.

We have reduced the number of directives coming from the department to our national laboratories and to our contractors by close to 40 percent. We can do better, and now what we are about is attempting not only to reduce the numbers, but the volumes and try to focus on site-specific guidance and to back out of the directives and orders business. We will have significant progress to report in that area within the next two months as we have been working in this area, especially with regard to health and safety which is a very difficult area to attack, but we have done that. We will be showing meaningful results, site by site, such that we will be focusing on Princeton and we will be asking Princeton what are their requirements rather than laying on them every requirement regarding health and safety for every facility that we have, so we are beginning to attack that problem as well.

EXECUTIVE BRANCH COORDINATION

Mr. FRELINGHUYSEN. How many directives would you get? I have a question that relates to this whole idea of directives and promulgation of rules and regulations because I read your statement rather carefully. I see only one comment relative to a collaboration with another executive department, that is the Department of Agriculture.

It seems to me somebody who is relatively new to this scene that if there has been a criticism, there is a sort of piling on effect here that people have testified to, they don't need to be—names don't need to be mentioned. You have got the EPA. You have got OSHA. You have got the Nuclear Regulatory Commission, and then someone says, well, you have also got the DOE in here.

Do these executive departments ever actually talk to one another? I mean, with all due respect, if you are promulgating rules and regulations, how do you know, in fact, that somebody over in the EPA hasn't thought up the same bright idea and added that on to another list of things for some of these groups to comply with?

Secretary O'LEARY. This Department does talk to its other executive agencies, and we, in fact, meet very formally and often with the Vice President. Where I have attempted to attach some credence to where we are regulating and States are regulating and the EPA is regulating is to identify the opportunities for backing out of our regulations and preferring to have someone else do it.

We have got a couple of pilots going, one of them at Lawrence Berkeley Lab to look for opportunities to remove regulations, but more often it is inspection and audit and the like, and the legislative requirement that puts, say, the Nuclear Regulatory Commission in a facility along with the Defense Nuclear Facilities Safety Board, along with the Department of Energy, that are some of the redundancies we have been looking at.

Last year, the Congress expressed the idea that the Department of Energy should get out of the regulatory business in the nuclear area and just this year we have named a very high-powered outside advisory committee, which will give us some answers to whether or not we can get out of the business entirely, and those answers are expected by July of this year. I very much look forward to that.

HEALTH AND SAFETY REGULATIONS

Of our own volition, we are attempting to get out of the regulation of health and safety and permit the Office of Occupational Health and Safety to take over that work. That proposal is now under a year old, and we are working with the Department of Labor to arrange for the pass-over of that responsibility because we have recognized, as you have, that we are probably not the best people to do that work. We ought to get out of it, so I am moving down that same road that you are. Likely not fast enough for you, but understand this is a very complex business that we do with many very dangerous facilities. We simply cannot walk away without ensuring that the responsibility is there, that the burden is greatly lifted, so I am on the same course that you are on.

OVERSIGHT REDUNDANCIES

Mr. FRELINGHUYSEN. I may not know the degree that you do of the fact of the complexity of some of these issues, but I get a gut feeling here that while we should be devolving ourselves of some of these redundancies that, in fact, one of the hindrances may be the fact that people have become so comfortable performing these responsibilities in various departments that it is more of an issue of job security than it is the issue of getting the job done. I would hope that there would be more collaboration between the departments and less of a concern about perhaps the issue of whether people might be cut from the payroll.

Secretary O'LEARY. I am understanding that, but in the Department's own case, it is not that we are trying to—that anybody is trying to save work that someone else may be doing. In the department we are self-regulated, and so to the extent that there is this attitude of hanging on to the requirement for the self-regulation, we are attempting to get at that through another exercise where actually examining the department's own alignment to understand how many people are doing the same jobs. I will cite you an example, and I mean not to eat up your time, but I think it is important for me to make certain that I have communicated this to you.

At some of our sites we have an Assistant Secretary for Defense Programs as well as an Assistant Secretary for Environmental Management with some site responsibility. Often there will be two sets of requirements having to do with the same occurrence or same activities, and there will be two sets of people there responsible for ensuring that that oversight takes place.

I am aware of that, and so that is why we are going through this exercise of pulling out the redundant requirements. This means that not only do we pull out the paper requirement, but we will in the end pull out people. We will have that accomplished by next fiscal year when I come to you with a much dramatically reduced budget. That will be because we have very carefully looked at how we are—how our systems are redundant.

GALVIN REPORT SAVINGS

Mr. FRELINGHUYSEN. It won't be as dramatically reduced as, perhaps, Mr. Galvin has suggested that you could be reduced by 8,000.

Secretary O'LEARY. With respect to Bob Galvin, whom I asked to undertake this task, and I am sorry that he is not here, we normally testify together, and I am much more comfortable doing this. I think the savings that Bob Galvin quantifies at 30 to 50 percent, people have taken to mean the entire budget of the laboratory, which is not true.

It would be the entire oversight budget or support budget that supports those functions. I have said this and need to say it again, the labs have to do their own jobs with managing more businesslike practices that have nothing to do necessarily with me. I have got my mandate, and everybody on this committee is going to see that I withdraw redundant and nonbusiness like directives and micromanagement, but after that the labs have a little work to do on their own.

I think I can bring the 20 percent or more to the table in the work that I am going to do, and after that we have got to look at the labs' mission and rationalize them against a shrinking demand over time for the work that they do. That will happen. The labs will need some—they will need some leadership, and I intend to provide it, and I know this committee will as well in terms of looking hard at their mission and finding out how they can accomplish it more cost-effectively as well. I think that is something the Department of Energy can do, but it shouldn't do alone.

NUMBER OF DEPARTMENT OF ENERGY FACILITIES

Mr. FRELINGHUYSEN. And lastly, how many offices does the DOE have around the country?

Secretary O'LEARY. Far too many, sir, and I am moving now——

Mr. FRELINGHUYSEN. How many are there?

Secretary O'LEARY. I cannot tell you the specific number, but I gather that you have a number, and I would agree with the number you have. What I would tell you——

Mr. FRELINGHUYSEN. I don't have any number at all. I am hoping you might tell me what that number is.

Secretary O'LEARY. I would tell you——

Mr. FRELINGHUYSEN. I had some material in front of me, but I don't actually have the number.

Secretary O'LEARY. I will tell you in this way, and it gets awfully confusing. I will tell you that we have 35 sites within the Department of Energy's major complex. We have existing approximately, I want to say, six operations offices, we have additional field offices, we have additional site offices.

I am now going through an exercise, as a matter of fact we had a public hearing on it last week, where we were identifying all those offices and more importantly moving to close a great number of them down. As you can well understand, this is not going to please a lot of people, but that is where I am going to——

Mr. FRELINGHUYSEN. You are not here to—you are here to do your mission, you are not here to——

Secretary O'LEARY. I understand that, and I understand my mission after two years was to do this, which is why I set on a course to accomplish this goal by having the Department itself do its examination. It is something I have learned in the private sector, and, by September of this year, not only will we have identified these redundancies, but we will have moved to close these facilities and I will be in the fight of my life to do it, but I intend to do it.

Mr. FRELINGHUYSEN. I am sure the Chair would like to see if we could actually get a specific number for every State in terms of the last couple of three years perhaps, and what the costs are of maintaining those facilities, the number of employees associated with each one of those facilities.

Mr. MYERS. Without objection.

Secretary O'LEARY. Mr. Chairman, we need to be clear with you that my target for having that work completed was at the end of April, and at the end of April I will be able to provide a rich detail State by State, site by site, people actually on the ground and what work they are doing.

Today I cannot do that simply because of the way the budget is racked, and that is part of this exercise at realignment, but more importantly after April what I will be able to do is project to you specifically the savings that we can accomplish once we rationalize this system.

Mr. MYERS. But you can provide his request for where you are today?

Secretary O'LEARY. Yes, I can, but I want to be clear that that will not be as rich a detail nor will it be as accurate as the information that I will have at the end of April.

[The information follows:]

FULL-TIME EQUIVALENTS

The information on full-time equivalents by organization is shown in the tables that I would like to insert for the record. This information covers FY 1994–1996 and is arranged by Office with cities and states provided in the comments column. Costs to maintain each office are not currently available and will be provided to the Committee when available.

[The information follows:]

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Full-Time Equivalents and Funding for Department of Energy Field Facilities

	—Full-Time Equivalents—			
Organization	FY 1994 Usage	FY 1995 Cong Req	FY 1996 Cong Req	Comments
Secretary of Energy Adv Board	0	9	9	
Congressional & Intergovernmental Aff				
Environmental Restoration Increase		2		
Congress & Intergov	65	70	72	
Nuclear Waste Fund	2	3	3	
Total	67	75	75	
Chief Financial Officer				
Chief Financial Officer	290	278	277	
Nuclear Waste Fund	3	3	3	
Total	293	281	280	
Defense Programs				
Stockpile Support	35	27	184	
Weapons Program Direction	148	124	154	
Stockpile Mgt				
General Mgt	5	4		
Program Support	107	81		
Materials Support	153	100	0	
Total	448	336	338	
Economic Impact & Diversity	59	56	60	
Energy Efficiency & Renewable Energy				Includes Atlanta, Boston, Chicago, Dallas, Denver, Kansas City, New York, Philadelphia, San Francisco, and Seattle Regional Support Offices
Solar Energy	60	65	76	
Geothermal Energy & Hydro	11	13	13	
Electric Energy & Storage	10	15	15	
General Mgt - Energy Supply R&D	5	5	5	
Program Support - Energy Supply R&D	24	26	26	
In-house Energy Mgt		6	6	
Buildings	66	81	82	
Industry	46	60	60	
Transportation	55	71	72	
Utility		9	9	
Tech & Financial Assist	248	258	257	
General Mgt - Energy Con	3	3	3	
Program Support - Energy Con	30	37	36	
Total	558	649	660	
Environment Safety & Health				
Environmental R&D	279	360	364	
EH- General Management	7	7	7	
EH- Program Support	29	11	11	
Weapons Program Direction	2			
Nuclear Safety Oversight	73	73	73	
Security Evaluations	29	32	32	
Nuclear Waste Fund	0	2	2	
Total	419	485	489	
Energy Information Administration				
Nuclear Waste Fund	3	3	3	
National Energy Info System	460	483	479	
Total	463	486	482	
Environmental Restoration & Waste Mgt				
Environmental Restoration	128	149	130	
Waste Management	158	168	147	
Technology Development	93	72	63	
Facility Transition	51	81	72	
General Management	1	61	53	
Program Support	202	210	279	
Tech Leadership Devep Program		50	6	
Environmental Mgt	0	31	484	
Total	633	822	1234	
Energy Research				
Biological & Env Research	60	62	62	
Fusion Energy	61	61	61	
Basic Energy Science	71	77	78	
Advisory & Oversight	91	82	79	
General Management	15	18	18	
General Science Prog Direction	48	55	56	
Superconducting Super Collider	39	4	0	
Total	385	359	354	
Science Education & Technical Info				Includes Office of Scientific & Technical Information
Advisory & Oversight	26	25	25	
Science Educ & Tech Info	164	169	167	
Total	190	194	192	

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Full-Time Equivalents and Funding for Department of Energy Field Facilities

	—Full-Time Equivalents—			
Organization	FY 1994 Usage	FY 1995 Cong Req	FY 1996 Cong Req	Comments
Fossil Energy				
Liquefied Gaseous Fuels	1			Includes Metarie Site Office
Clean Coal Technology	22	24	23	
ETC Technical Prog Direction	4	6	6	
HQ Technical Program Dir	91	90	91	
General Mgt	7	7	7	
Program Support	22	24	24	
Fuels Program	27	24	24	
Naval Petroleum Reserves	18	19	19	
SPR Storage & O&M	38	36	36	
Total	230	230	230	
Associate Deputy Secretary for Field Mgt				
Environmental Mgt increase		7		
Field Management	88	92	99	
Employee Concerns Program	0	0	6	
Total	88	99	105	
General Counsel				
Environmental Mgt increase		7		
General Counsel	153	162	181	
Nuclear Waste Fund	6	3	3	
Economic Regulatory Administration	53	49	29	
Total	212	221	213	
Hearings & Appeals				
Board of Contract Appeal	6	8	8	
Hearings & Appeals	82	81	81	
Total	88	89	89	
Human Resources & Administration				
Science & Eng Rec, Training	22			
Secretary of Energy Adv Board	7			
Environmental Mgt Increase		11		
Human Resources & Administration	966	944	920	
Nuclear Waste Fund	10	7	7	
Total	1,005	962	927	
Inspector General	358	356	356	
Fissile Materials Disposition				
Materials Production	0	20	30	
Nuclear Energy				
Nuclear Energy R&D	95	80	85	
Gen Mgmt	6	7	7	
Program Support	54	33	33	
Uranium Enrichment	33	10	19	
Isotope Support	6	6	12	
Naval Reactors Development	60	60	60	
Total	254	196	216	
Nonproliferation and National Security				
Emergency Mgmt	27	29	30	
Arms Control	57	44	49	
Research & Development		11	11	
Nuclear Safeguards & Security	144	136	149	
Intelligence Activities	86	69	77	
Energy Emergency	39	41	41	
Total	353	330	357	
Public Affairs				
EM Increase		1		
Departmental Admin	56	54	55	
NWF	1	1	1	
Total	57	56	56	
Office of Policy				
Environmental Analysis	18			
EM Increase		2		
Departmental Admin	159	193	192	
Energy Emergency	26	26	25	
Total	203	221	217	
Quality Management	0	12	12	
Federal Energy Regulatory Commission	1,434	1,463	1,453	
Office of the Secretary	29	30	30	
DUS for Technology Partnerships	0	18	19	
Worker & Community Transition				
Weapons Activities		10	18	
Environmental Mgmt		5		
Departmental Admin		3		
Total		18	18	

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Full-Time Equivalents and Funding for Department of Energy Field Facilities

	—Full-Time Equivalents—			
	FY 1994	FY 1995	FY 1996	
Organization	Usage	Cong Req	Cong Req	Comments
Albuquerque Operations Office				Includes Amarillo Area Office, Carlsbad, Kansas City Area Office, Kirtland Area Office, Los Alamos Area Office, Pinellas Area Office
Weapons RD&T	92	100		
Stockpile Support	787	749		
Weapons Prog Dir - Defense Prog	557	500	505	
Stockpile Management			741	
Stockpile Stewardship			100	
Environmental Restoration	60	104	104	
Waste Management	60	128	133	
Technology Development - Envir Mgt	15	19	19	
Industry	2	2	2	
Total	1,573	1,602	1,604	
Alaska Power Administration	33	35	35	
Bonneville Power Administration	3,596	3,440	3,325	
Bartlesville Project Office	24	27	27	
Chicago Operations Office				Includes Argonne Area Office, Batavia Area Office, Brookhaven, Environmental Measurements Lab, New Brunswick Lab, Princeton Area Office
Nuclear Energy R&D	12	13	13	
Biological & Env Research	88	88	88	
Fusion Energy	18	19	19	
Basic Energy Sciences	5	7	7	
Gen Science Prog Direction	14	18	18	
Environmental Restoration	14	36	39	
Waste Management	11	22	22	
Technology Development - Envir Mgt	4	5	5	
Facility Transition		1	1	
Nuclear Safeguards & Security	65	64	64	
Chicago Ops Office	329	319	318	
Industry	6	5	5	
Tech & Financial Assistance	4	3	3	
Total	570	600	602	
Civilian Radioactive Waste Management				Includes Yucca Mountain Site Characterization Project Office
Civ Radioactive Waste R&D	2	2	2	
Nuclear Waste Fund	181	185	220	
General Management	4	4	4	
Program Support	29	29	29	
Total	216	220	255	
Golden Field Office				
Solar energy	11	32	32	
Prog Support (Energy Supplly R&D)	2			
Industry	2			
Tech & Financial Assistance	14			
Program Support (Energy Con)	7	10	10	
Total	36	42	42	
Idaho Operations Office				
Geothermal Energy & Hydro	2	2	2	
Nuclear Energy R&D	1	1	1	
Environmental Restoration	34	35	35	
Waste Mgt	149	146	147	
Technology Development - Envir Mgt	13	14	14	
Facility Transition	71	80	80	
Arms Control	1			
Naval Reactors Development	10	10	10	
Idaho Ops Office	172	168	168	
Nuclear Waste Fund-Civ Rad Waste Mgt	5	2	2	
Industry	4	4	4	
Total	462	462	463	
Morgantown Energy Technology Center				
Technology Development - Env Mgt	10	14	14	
Clean Coal Technology	29	29	27	
Direct Staffing	98	92	91	
Technical Program Direction	194	182	182	
Total	331	317	314	
Casper Naval Petroleum Reserve	14	14	14	
Elk Hills Naval Petroleum Reserve	52	43	43	
Nevada Operations Office				
Liquefied Gaseous Fuels	1			
Weapons RD&T	167	160		
Weapons Program Dir - Defense Programs	173	171	170	
Stockpile Stewardship			150	
Environmental Restoration	15	32	34	
Waste Mgt	12	24	24	
Technology Development - Envir Mgt	10	9	9	
Arms Control	7	9	9	
Nuclear Waste Fund	3	4	4	
Total	388	409	400	

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Full-Time Equivalents and Funding for Department of Energy Field Facilities

Organization	—Full-Time Equivalents— FY 1994 Usage	FY 1995 Cong Req	FY 1996 Cong Req	Comments
Ohio Field Office				Includes Fernald Area Office, Miamisburg Area Office, West Valley Area Office
Stockpile Support	2	39		
Environmental Restoration	77	124	147	
Waste Mgt		52	61	
Facility Transition		30	37	
Total	79	245	245	
Oakland Operations Office				Includes Energy Technology Engineering Center Site
Nuclear Energy R&D	7	3	3	
Fusion Energy	3	2	2	
Uranium Enrichment Activities	2			
General Science Program Dir	5	7	7	
Weapons Prog Dir - Defense Program	89	88	88	
Environmental Restoration	19	40	43	
Waste Mgt	25	43	43	
Technology Development Envir Mgt	4	4	4	
Oakland Operations Office	246	254	253	
Total	400	441	443	
Oak Ridge Operations Office				Includes Paducah Site Office, Portsmouth Site Office, Superconducting Super Collider Termination Project, Weldon Spring Site Office
Nuclear Energy R&D	15	15	15	
Uranium Enrichment Act	31	35	35	
General Science Prog Dir	8	8	8	
Superconducting Super Collider	34	49	19	
Stockpile Suppport	85	77		
Stockpile Mgt			77	
Environmental Restortion	73	117	122	
Waste Mgt	26	54	57	
Technology Development - Envir Mgt	6	10	10	
Oak Ridge Ops Office	414	408	404	
Nuclear Waste Fund	1	1	1	
Transportation	0	1	1	
Total	693	775	749	
Pittsburgh Energy Technology Center				
Technology Development - Envir Mgt		2	2	
Clean Coal Technology	34	33	26	
Direct Staffing	95	95	93	
Technical Program Direction	189	179	181	
Total	318	309	302	
Pittsburgh Naval Reactors	79	79	78	
Rocky Flats Area Office				
Stockpile Support	30	3		
Stockpile Mgt			3	
Environmental Restoration	11	40	40	
Waste Mgt	18	32	32	
Technology Development - Envir Mgt	5	3	3	
Facility Transition	157	224	227	
Total	221	302	305	
Richland Operations Office				
Nuclear Energy R&D	7	7	7	
Environmental Restoration	26	41	41	
Waste Mgt	142	219	220	
Technology Development - Envir Mgt	6	9	9	
Facility Transition	259	304	303	
Nuclear Waste Fund	1	1	1	
Total	441	581	581	
Southeastern Power Admin	42	41	41	
Schenectady Naval Reactors	68	70	69	
Strategic Petroleum Reserves	126	130	129	
Savannah River Operations Office				
Stockpile Support	10	10		
Stockpile Mgt			10	
Environmental Restoration	22	51	51	
Waste Mgt	78	173	176	
Technology Development - Envir Mgt	2	2	2	
Facility Transition			372	
Materials Support	431	387		
Total	543	623	611	
Southwestern Power Admin	198	196	195	
Western Area Power Admin				Includes Billings Area Office, Loveland Area Office, Phoenix Area Office, Sacramento Area Office, Salt Lake City Area Office
Operations & Maint	1,281	1,258	1,252	
Colorado River Basin	223	209	208	
Total	1,504	1,467	1,460	
Vienna Austria				
Arms Control	1	1	1	
Geneva, Switzerland				
Arms Control	1	1	1	

Full-Time Equivalents and Funding for Department of Energy Field Facilities

Organization	---Full-Time Equivalents--- FY 1994 Usage	FY 1995 Cong Req	FY 1996 Cong Req	Comments
Johnston Island				
Arms Control	1	1	1	
Paris, France				
Departmental Admin	1	1	1	
Tokyo, Japan				
Departmental Admin	1	1	1	
Moscow, Russia				
Departmental Admin	0	1	1	
Department of Energy Total	**19,838**	**20,549**	**20,839**	

Mr. MYERS. That is understood. Thank you.

Mr. FRELINGHUYSEN. Thank you.

Mr. MYERS. Thank you, Rod.

Mr. Fazio.

POWER MARKETING ADMINISTRATION PRIVATIZATION

Mr. FAZIO. Thank you, Mr. Chairman. I had, as you might have guessed, a number of questions on power marketing administrations as well. What I will do is submit them for the record, and ask you to respond to me as you try to respond to Mr. Bevill. I just wanted to highlight, though, my concern that while we have said that we want to protect ratepayers, hold them harmless, so to speak, we have also said that we want to maximize the benefit to the taxpayers. We have certainly laid out there the tension.

I am not sure we can do everything that we say we want to do, but it is an ongoing concern, and I am also interested in your focusing, as I asked Secretary Babbitt, on how we handle the simultaneous desire to sell WAPA at the same time as the Central Valley Project water activities to joint powers agreement, the State of California, whatever. The water and power are interrelated, and it may or may not be possible to sever those and to make them available in ways that perhaps were envisioned when we thought of selling WAPA's transmission lines.

I will just leave that on the record because I think it is a concern. Both of these are moving on their own track, and I hope that when we hear from the Department there may be some thought given to that.

NATIONAL IGNITION FACILITY

I would like to get on to a subject you touched on earlier, and that is NIF. The Galvin Report that you have requested supports NIF. The JASONs, the Drells, the Happers, the Panofskiefs of the world are strongly supportive of moving forward on something that they see as critical to our stockpile program as well as our scientific capability in this country, and I think the Department has clearly moved in the direction of outright support.

I wanted to ask if you would indicate for this committee where you think this should be sited. My impression, and it is a biased one, I will admit, is that we have our strongest laser expertise at Lawrence Livermore. We have clearly had a long line of predecessor lasers at that site, and I am wondering if you could give us some feeling as to what the Department's thoughts are in terms of siting NIF.

Secretary O'LEARY. I can share with you not only the Department's thinking and feeling, but I can share with you my own.

Mr. FAZIO. I have always assumed that was the same.

Secretary O'LEARY. Not all the time, not all the time. I have a large group of very sophisticated scientists working for me, and sometimes we don't see things the same way. When that is the case, I take the best advice from my scientists, but in this regard I think everyone knows that we are all of the same opinion, and that opinion, of course, is that the preference that I indicated when we announced the beginning of the undertaking of the draft environmental impact statement that my personal preference and the Department's preference was for Lawrence Livermore.

You have just articulated why and that is because residing in that facility are the best minds, the most complex and sophisticated laser work now going on there. On the two occasions that I had the opportunity to visit the facility before the announcement, I was very clear on the fact that not only would we get the best thinking, but because of the work that has been long going on at that site, we will also save the taxpayer money as we go about developing this facility. I don't always indicate a preference for site, but I did in this case and I thought that the facts both in the science and the economics were compelling. Now we will go through the environmental work and if the Secretary and her scientists are wrong, we will tell you so.

B-FACTORY

Mr. FAZIO. Well, we look forward to hearing progress reports on that throughout the year. I wanted to ask also about the B-factory. I understand that we are on target at Stanford. I understand the President's budget provides sufficient funds to continue, but I would like you to give the subcommittee a few minutes of an update on this issue. There are still people who I think have questions about moving in this general direction, and I would like you, if you could, to indicate to the committee what you think the benefits to DOE and to the scientific community are both in the short run and over a longer period of time.

Secretary O'LEARY. I want to start by focusing, once again, on the difficulty to identify clear short-term benefits from a scientific project like the B-factory. I am a lawyer, not a scientist, and when I was at the facility when we announced the decision to go forward with funding for the B-factory, I was just wracking my brain to think of a way to communicate to the general public what the benefits would be. I finally saw a young child in the audience because the young child cried, and I asked someone to bring the baby to me, and the way I then described the benefits was to say that, quite frankly, I did not know what they were today, but I knew that that baby, whose name I can now tell you is Emily, would receive the benefits in her lifetime, and that is just the way we have approached all the basic science that we have supported.

And interestingly enough, I will share with you the fact that I had Dr. Martha Krebs trying to explain to me a benefit of another basic science program. She said it was just like in the old days when we did not understand what neutrons are and today we are scattering them to do things more powerful than we ever imagined. One of which will ultimately be the disposition, we believe, of fissile material. So it is with that faith that the American public has to go forward. And I have found over the two years that I have been in the job that it is very important to communicate that we don't yet know the benefit, but to point back to the benefits that have resulted from the basic science in which this country has now invested for over 50 years.

Mr. FAZIO. Well, perhaps the Galvin Report's chief benefit was the reiteration of the commitment to basic research from people in the private sector who have proven that it doesn't take that many years certainly in the life of a country like ours to bring from the research laboratory to the business sector the kinds of breakthroughs that we never know we are going to make.

I would, for the record, appreciate it if you could show us what systems and procedures we have in place to keep the B-factory on time and under budget because we have learned from prior projects in this committee that when we slip those kinds of deadlines, we end up with tremendous problems in sustaining on an ongoing basis congressional support.

Secretary O'LEARY. I would be pleased to, I will tell you that I have been personally involved in establishing and seeing that those systems exist, but more importantly I have pushed the responsibility for them down to the site so that we are not micromanaging here and the people who are actually at site and have responsibility own those milestones and deliver on them. I would be pleased to provide that.

[The information follows:]

B-FACTORY

The construction of the B-factory is a joint collaboration of three laboratories, SLAC, LBL, and LLNL, led by SLAC. The Department of Energy, working with the B-factory management team, has put into place a detailed management plan that specifies management structure, relations, and responsibilities for B-factory construction. The working relations between SLAC and LBL and LLNL are established by formal memoranda of understanding which are updated semiannually to keep abreast of the changing needs of the work. In addition, a formal Project Management Control System (PMCS), based on the Primavera/Cobra commercial software, has been put in place and validated by an independent review team as being fully functional as a cost schedule and management tool for the B-factory project.

Construction progress is monitored by a dedicated on-site DOE management team led by an experienced project manager with an extensive engineering background and through semiannual technical, cost, schedule and management reviews. Each of these reviews is chaired by DOE and includes specialists on all aspects of project design, construction and management. A particular feature of the semiannual reviews is the use of highly qualified consultants (not DOE staff) who are experienced in the science, technology and construction of other, similar colliding beam facilities for high energy physics.

OFFICE OF TECHNICAL ASSESSMENT FUSION REPORT

Mr. FAZIO. I appreciate that. I have been on this committee long enough to remember that we used to spend a great deal of time talking about the energy crisis, and many of us, certainly Mr. Myers and Mr. Bevill, have been through several of them, and I have been through my share.

I think what I would like for you to do for the committee briefly is to indicate where you think we are going in terms of our dependence on foreign oil because while the issue at the moment is in abeyance, we have obviously a rather placid world oil market. OPEC seems to be incapable of coming out of their disarray. We clearly have a problem that is just below the surface, and when we talk about fusion and other long-term research projects, we may be talking about the solution to our dependence, but I think, frankly, that is so long term, and parenthetically, by the way, would you take a look at the OTA work on fusion. I don't know if you would have time to look at it, but if you would some time and give the committee your response to it.

Secretary O'LEARY. I will. I will tell you that I read about four or five paragraphs of the executive summary. I will take a harder look at it.

Mr. FAZIO. I would appreciate it. I am sure other members of this committee who have been struggling with fusion would like your reaction to it.

Secretary O'LEARY. Thank you. We will do that within two weeks to return that.

Mr. FAZIO. I appreciate it. The more timely the better.

Secretary O'LEARY. Okay.

[The information follows:]

TOKAMAK PHYSICS EXPERIMENT

In April 1994 Congressman Swett convened a hearing on the role of Alternates in the fusion program. As a result of that hearing and subsequent concerns expressed by Congressman Swett, Congressman George Brown asked the Office of Technology Assessment (OTA) to evaluate two questions of importance to the Fusion Program: (1) What is the role of the proposed Tokamak Physics Experiment (TPX)? and (2) What is the role of alternatives to the tokamak concept in a broad-based fusion energy program? We have reviewed the OTA report prepared in February, 1995 and our comments on the findings are as follows.

Finding:

"The role of the fusion energy program in meeting long-term energy needs and the level of research effort justified by that potential role are critical issues for the program."

Comment:

Development of fusion energy requires and deserves a sustained commitment at the national level, and should be a high priority given the limited number of future energy options and the enormous role energy plays in the world economy. It is entirely appropriate for the government to undertake such a long-term effort.

Finding:

"Much progress has been made in fusion energy research over the past few years, but far more remains to be done."

Comment:

Much progress has been achieved in fusion energy research despite past budgets which have fallen far short of plans. In fact, the power output seen in tokamak experiments has improved by a factor of ten million over the past 25 years. It is true that substantial scientific and engineering challenges still lie ahead. Annual budgets would have to increase by a factor of two or more to attain the present fusion program milestones.

Finding:

"Despite congressional requirements in the Energy Policy Act of 1992, as of December 1994, DOE has not issued a strategic management plan for the fusion energy program by which the program's progress can be judged."

Comment:

The Department is in the final stages of preparing a strategic management plan for fusion energy. Progress has been hindered by the rapidly changing budget environment.

Finding:

"Without substantial funding increases, the [fusion] program will have to change significantly from the current direction and new goals will have to be set."

Comment:

Without substantial funding increases, the fusion program cannot move onward with full-scale energy development efforts envisioned in the Energy Policy Act. The program would continue to be focused on the scientific investigation of fusion energy issues to improve the prospects for future fusion power plants.

The Federal Government is the appropriate and the only source of funds for fusion development. Although the requirement is larger than the current level, it is small in the context of the country's energy infrastructure, or annual expenditure for energy, or the ultimate potential of fusion.

Finding:

"TPX is not scheduled to provide any unique scientific and technological advances essential to ITER."

Comment:

The ITER design is intentionally conservative, such that it does not heavily rely on advances from any future experiments, and its schedule has always been independent of that for TPX. ITER would obviously make maximum use of TPX results as they became available.

TPX is aimed at (1) improving the performance and economic attractiveness of a tokamak power plant and (2) developing the technology needed for continuous operation of a fusion power plant. TPX complements ITER. Both are needed to design a cost effective demonstration power plant. However, TPX will provide valuable information on long pulse operation to ITER and possibly develop techniques for improved operation that can be tested in ITER. TPX will involve U.S. industries in the fusion program in a substantial way and will help prepare industry for participation in ITER.

Finding:

"No other partner in the ITER project has found it essential to pursue a device with TPX's capabilities as part of the program for successful development of ITER."

Comment:

While not essential to ITER, it is an essential element in the development path of fusion. It will provide a replacement for the TFTR and will build on the recent successes of TFTR. Both Europe and Japan are continuing to make substantial investments in additional domestic fusion research facilities of a similar scale to TPX but which have different and complementary missions.

Finding:

"While the potential benefits of TPX to ITER can be real, their magnitude is uncertain, and DOE has not estimated their value. Further, there are no plans to account for the benefits of TPX to ITER as part of the direct contribution to the U.S. commitment to ITER."

Comment:

As already mentioned, the primary TPX mission is a better demonstration plant, not support of ITER. DOE has also identified potential benefits to ITER from TPX. It is not possible to estimate their value until the design of ITER is further along. Each party's direct contribution to ITER is quantified and measured according to the terms of the EDA agreement. Their domestic research programs, which for the U.S. would include TPX, are implicitly assumed to be providing supporting R&D to ITER.

Finding:

"Unless tested in ITER, there will likely be considerable uncertainty of the transferability of TPX results to DEMO."

Comment:

We agree that the results from TPX would need to be tested in ITER in order to make use of them in the construction of a Demo Power Plant. Without TPX however, such experiments may never be conducted because of the size and scale of ITER operations.

Finding:

"The value of TPX to the magnetic fusion energy program could increase if ITER is delayed."

Comment:

Delaying ITER by several years in order to incorporate the results of TPX has not been discussed with our ITER partners. If the U.S. were to propose such a delay, the future of a construction collaboration could be seriously jeopardized. In addition, the delay necessary to fully make use of TPX results and redesign ITER would set back the timetable for fusion development by at least a decade.

Finding:

"Regardless of decisions on TPX, the overall tokamak fusion energy effort will require justifying a series of expensive research activities, of which the U.S. contribution to ITER presents the largest single budgetary requirement in the near future."

Comment:

Nearly a decade ago, world fusion program leaders recognized that budget limitations in the U.S. and elsewhere would make it difficult to continue a fusion energy development program unless the costs were shared. Their vision of an international engineering test reactor has progressed to the engineering design stage - the ITER Engineering Design Activities.

Finding:

"Over the past few years, the fusion energy program was substantially narrowed to focus on the tokamak primarily for budgetary rather than technical reasons."

Comment:

Budgetary restrictions contributed substantially to the narrowing of the foc of the fusion energy program in the 1990 time frame. However, a change program emphasis, based on a recommendation of the Fusion Policy Adviso Committee, to advance to a goal-oriented energy program was also a major factor. The selection of the tokamak was primarily based on the physics performance of the tokamak approach relative to others that had been or were being investigated.

Finding:

"There is a widely held view that the narrowing of the fusion energy program was premature and did not reflect the benefits of pursuing alternate concepts."

Comment:

Alternates concepts are not at the stage of development where increases in the scale of the devices is warranted [see comment above]. However, the fusion energy program does maintain a modest alternate concept effort in which the emphasis is on the basic physics of the concepts. This should set the stage for expanding the effort on alternates if the progress is warranted.

Finding:

". . . promising alternative concepts, including novel ones, may provide a fusion energy option should the tokamak prove technically infeasible or commercial unattractive."

Comment:

The basic technical feasibility of the tokamak approach for fusion energy production is not in doubt. What remains to be established is the commercial attractiveness of the tokamak approach. It is for this reason that alternates may eventually play a role in fusion energy development.

Finding:

"DOE suggests that a 'healthy, but constrained' alternate concepts program would require about a $100 million per year."

Comment:

The level of development of alternate concepts varies significantly as noted in the OTA report (p. 72). A healthy program would require support of concepts at several stages of development, and would require facilities construction, as justified by concept advances.

Finding:

"However, a substantial amount of information that provides a firmer basis for making future alternate concept decisions could be developed with a far more modest program."

Comment:

The Department presently conducts a far more modest program in alternate concept development. Such a program can always be made less expensive by eliminating some of the concepts and reducing the level of information and results sought from the remaining concepts under development.

During a twenty year period of aggressive development of alternate concepts, the Department evaluated most of the fusion concepts listed in the OTA report (Table 4-1), and the unsupported novel possibilities were much less attractive than the alternate concepts that had been reviewed and were under development in 1990.

Finding:

"However, proponents suggest a development path for the heavy ion driver IFE concept that could be substantially more flexible and less costly than that planned for the tokamak development effort."

Comment:

We endorse the OTA report's comments concerning the technical uncertainty associated with IFE, and development program cost uncertainties as well.

Finding:

"In summary, while alternate concepts provide no panacea for fusion energy development, there is merit in examining them as part of a broad fusion program."

Comment:

These issues effecting the balance of the effort in the fusion program are characteristic of development programs. In 1990, the Fusion Policy Advisory Committee recommended undertaking an applied energy development program. Their recommendations did include programs of alternate concepts as well as a broad program of IFE driver development. However, budget stringency's required a setting of priorities among the program elements, and the present levels of effort in the several program elements have been the outcome.

ENERGY SUPPLY

Mr. FAZIO. But I understand you have a lot of testifying to do. I am, however, anxious to get your remarks on where you think we are going in terms of our energy supply and in terms of what is just below the surface, the next crisis in terms of our declining domestic production, alternatives, natural gas and other things that are out there.

After all, as the Department's basic purpose is brought into question, I think it seems at the moment perhaps unfashionable to focus this question, but it needs to be addressed, what is Congress and what is the Department doing at the moment with the placid environment that we are part of lulling us into perhaps a false sense of security?

Secretary O'LEARY. Not being placid, I trust. The most recent finding on this issue comes out of our colleagues at the Commerce Department who were asked on an application by the independent oil producers to review the steady increase of oil imports and give an indication whether they thought those increases were a threat to national security.

The Commerce Department report was made public at the time I was in China. I believe that is when it was. Their finding is that there continues to be an exacerbation to our national security because of that steadily increasing importation of both crude oil and refined product. That report, then, went on to state that we ought as a government to continue to focus on both energy efficiency, alternative energy, and certainly the use of natural gas and then gave more than support to the work we are doing in the more advanced technologies.

CRUDE OIL

Where the report did not give me a high level of comfort, and I want to be careful with the language I use because I am not meaning to criticize my colleagues at Commerce, was that it did not begin to look at what we as a Nation need to begin to do to try and stimulate more production in the United States. You may know that last week our administration announced its support of the lifting on the ban on exports of Alaskan crude oil.

Mr. FAZIO. You have my strong support on that, I want you to know.

Secretary O'LEARY. I thought we might, Mr. Fazio. But let me point out why for the entire committee and for the record. It is because we believe that that export—we know by our economic and our modeling analysis that that artificial holdoff of that crude oil from its natural market, which would be West, not South to California, has reduced the price of oil in California and in other areas where marginal oil wells could be explored and could be producing if the price signal were correct.

It took us a very long time to get that agreement with and among our colleagues. I am very pleased that we have taken that step. We have also taken some steps within our own budget to aid both exploration of petroleum and natural gas for the use of, again, the technology, the seismic technology as well as the computing technology coming out of our national labs to try to help reduce the cost of exploration.

STRATEGIC PETROLEUM RESERVE

In my mind, the SPR is, of course, another form of insurance which is perhaps at the right size at this time because of the more diverse supplies coming from places like Mexico, Venezuela, and more and more Canada, especially with respect to natural gas. Nonetheless, this is an issue with which we must continue to grapple, and for two minutes I need to focus on how important it is not to let off on energy efficiency because it is through the automobile and through creating a more efficient automobile that we will really begin to get at this puzzle because most of the imports in the United States go to propelling our transportation sector, and in this area where we have funding in our energy efficiency program.

I cannot say how important I believe that our work on clean car and the battery consortia are in terms of helping us stem the use of petroleum products for transportation and especially that by automobile and truck, so thank you for giving me that opportunity.

ELECTRIC VEHICLES

Mr. FAZIO. I am anxious to see that we look at the unobligated funds on EVs in this regard. I think we have probably been pushing the pedal to the metal a little bit more on natural gas, but as a State that is a part of an area with several nonattainment regions, including my own district, we do need to make sure we don't have biases among the various approaches to clean cars.

Secretary O'LEARY. I absolutely agree with you. I just noted on the weekend that a direction that I had given some three or four months ago to ensure that there was a better balance in terms of funding somehow, like a bad vaccination, did not take. That now has my attention. We will revaccinate the patient.

BIOMASS PROJECT

Mr. FAZIO. Sounds good. Appreciate that. I will just conclude by thanking you for the assistance the Department has been giving us on a very unique project in Gridley, California, in Butte County in my district where we have a consortium of private utilities, the State Energy Commission, the Renewable Energy Lab, the University of California–Davis, the rice industry, all putting together a very unique breakthrough biomass facility. I want to thank the Department. This is not a large issue in dollars, but I think it is a very important breakthrough in the biomass area. Certainly for an industry that was thought to have little real energy content in its waste product. And I really want to commend highly those people in the Department who have taken this and really worked it in every sense. I think we are going to be very proud of a breakthrough kind of facility.

Secretary O'LEARY. I agree with you very strongly and will tell you that in the time I have spent in Pakistan, India and China, well do I understand the application both in the United States, but in developing countries to use this thing that has been considered a waste product to power villages and farm communities where they will not likely have opportunity to attach to the grid in my lifetime.

Mr. FAZIO. There is no question much of what we are doing has export potential. I am glad to see we are now carrying through on that. Thank you very much. Thank you, Mr. Chairman.

WASTE ISOLATION PILOT PLANT

Mr. MYERS. Thank you. Madam Secretary, down in New Mexico there has been an ongoing salt dome research program. Can you describe briefly what we are doing there?

Secretary O'LEARY. Well, we are doing a lot better than we used to do, as a matter of fact, this month——

Mr. MYERS. Here we go again.

Secretary O'LEARY. Well, sir, you have got to start someplace, Mr. Chairman. I can only start from January the 23rd, 1993. That is when I opened the door and found the computers stripped of everything. I am committed as——

Mr. MYERS. Run that by me again. The computers stripped of everything?

Secretary O'LEARY. I opened the door to the Department of Energy, there was not a—everything gone, poof, gone.

Mr. MYERS. Why did you not tell us before about that?

Secretary O'LEARY. I have mentioned it several times, but no matter.

Mr. MYERS. That is inexcusable. Okay.

Secretary O'LEARY. I promise to leave the computers up and running when I turn out the lights. I do.

Mr. MYERS. How soon do you plan on doing that?

Secretary O'LEARY. Don't believe a rumor you hear, sir. I intend to be here for the duration. I have got about six major efforts going to deliver on this commitment I have made to this committee and the President to cut costs, and I intend to see it through. I believe it is very important to do that.

Mr. MYERS. Well, back to New Mexico.

Secretary O'LEARY. Once again, as I made the point that I have put responsibility where it belongs. The responsibility for getting the WIPP project open rests in George Dials who actually manages that project, it doesn't rest in Tom Grumbly. It doesn't rest in Albuquerque Operations office. It doesn't rest in the field office. We are now committed to the opening date, which is 1998.

When I arrived, that date seemed to be slipping. We have established a routine course of quarterly examinations to be certain that we are on track. At those routine program reviews, I have invited the EPA nationally, the EPA at the regional level, the State environmental resources office, someone representing the Governor as well as the laboratories who are working on this initiative, so that we can clearly see where milestones may be slipping because of lack of coordination or where there is some scientific issue that may be driving us to less than success.

I personally attend quarterly reviews to ensure that this project stays on track, and we have ensured in the budget that we put forward for 1996 as well as in the rescissions that have been so far ordered that we are not affecting the opening of WIPP. That needs to be done for several reasons.

Someone has to prove to the American public that the Federal Government, the Department of Energy, can open a waste repository. I believe I have the opportunity to do that on my watch. I intend to do that.

More importantly, to the sites who look forward to shipping their transuranic waste out of their communities into this site, we have got to prove that we can deliver on these commitments. It is very important to me that we do that, and so I have worked with my colleagues to ensure that the regulations that need to be written, the scientific proofs that have to be put on the table are robust and healthy and timely. I mean, this has my personal attention, and it has the personal attention of George Dials as well as Tom Grumbly.

ENVIRONMENTAL AND POLITICAL CONCERNS

Mr. MYERS. All of the environmental and political questions have been resolved then?

Secretary O'LEARY. Well, that is not as easily said as one would like, but at each step of the way where there have been conflicts or appearance that conflicts might exist as we have been drafting regulations and negotiating them, I have been working and my colleagues have been working with the Environmental Protection Agency as well as the State to resolve conflict. Can I say to you that all conflict is resolved? No, I cannot.

Principally, because there are some people who do not want to see that site opened, and there are also some people who believe that the standards for both the technical work and the safety ought to be higher. We are doing our job there and we are on target, and if we are not on target, I will report to you because you will need to know that. I have every intention of personally attending to ensure that the milestones are met or, more importantly, where I can help the negotiation personally that I am aware of it and can step in.

NUCLEAR WASTE FUND LEGISLATION

Mr. MYERS. Going back to Yucca Mountain. You said a moment ago that you are requesting legislation, is that the way I understood you, for authorization?

Secretary O'LEARY. That is correct.

Mr. MYERS. For interim storage?

Secretary O'LEARY. No. We are requesting——

Mr. MYERS. How would you classify it?

Secretary O'LEARY. We are requesting legislation, first of all, to get at the Nuclear Waste Fund, to begin to spend more than the Congress has previously permitted us because that is all the administration has asked for. I want to put the blame there where it lies.

Mr. MYERS. $413 million.

Secretary O'LEARY. That is correct, sir. Now, with respect to legislation for the interim facility, the administration has offered no legislation of its own, and my position has been, and it is the position of my colleagues and my principals, that there is enough on the table now that has been introduced. The better role we can serve is to work with those proponents who have already hoppered bills, and we are endeavoring to do that.

We have been working, especially in this last week, very closely with the Senate, and we will be working with the House as well on its legislation. I don't think we need another legislative proposal. We need to work with the language, the legislation that has already been hoppered.

INTERIM WASTE STORAGE

Mr. MYERS. You hope to, would you call that monitored retrievable storage or are you calling that interim storage? How are you going to classify that?

Secretary O'LEARY. I am calling it interim storage, but much as the Bennett Johnston bill does, it outlines many other requirements. Of course, it addresses the question of interim storage, and I have tended not to use the other language because it has its own bad history.

YUCCA MOUNTAIN CHARACTERIZATION

I am also asking for certainty that we continue to characterize Yucca Mountain because, as Mr. Bevill has said, if we stop the long term, then the interim storage, becomes the permanent storage and no one is happy with that, and I am also asking for some contingency planning capability should we arrive at 1998 and Yucca not be buildable. We don't have that answer yet. I cannot imagine going forward without the ability for contingency planning.

WASTE REPOSITORY BY 1998

Mr. MYERS. Is there any way possible for something to be available by 1998, understanding the political and the environmental questions that will come up?

Secretary O'LEARY. No, sir. I am sorry. I really should have had this briefed from Dan Dreyfus today, but I know that he, over the weekend, really has begun to look very hard at the legislative proposals to answer the question whether there can be something by 1998.

With the greatest respect for Mr. Johnston, who is not only a colleague of mine, but an old friend, I think his language is really attempting to get us to a repository by 1998, and in my humble opinion, having worked with many States on this issue, I don't think if we completely obliterate opportunities for public participation that we win very much. So, I am very skeptical about something that presumes that we can meet 1998 by withdrawing from the general public public participation opportunities that they have long had in matters involving siting of nuclear facilities. I don't think that makes good sense.

INTERIM STORAGE SITES

Mr. MYERS. When Yucca Mountain was selected there were a number of other sites that were under consideration. Has any thought gone back to reexamining those other sites for this interim storage?

Secretary O'LEARY. Certainly not by this Secretary of Energy.

Mr. MYERS. You are the only one we have got right now.

Secretary O'LEARY. I want to tell you why, sir. I don't believe, having been both involved and having been a student of very careful history of the process that took us from 21 to nine to seven to three and finally one site, an act done by the Congress, that it benefits me to start sniffing around other sites now until there has been some determination between our Administration and the Congress that that contingency that I desire is something, in fact, that will be legislated.

Once that happens, I think we have to be very careful about establishing criteria for that examination or we are going to, to use my mother's favorite word, "spin off" the 21 States that were being examined the first time around. A number of those States were withdrawn for technical and geological reasons, and I would not like to start that examination again. I think we need to pick up from the benefit of the examinations that went on in the late 1970s and not relive that history. It was bitter. Some of you remember.

Mr. MYERS. I recall now, going back to several years ago, one of the considerations was some of the salt domes in New Mexico and elsewhere where it could be stored. There is no chance of this WIPP being used for other than transuranic?

Secretary O'LEARY. That was the original Jim Schlesinger proposal. I have spent probably more time than you would like talking about how important it is to complete the WIPP project. Those are the salt domes that we were focused on. I have got my sights on the WIPP for the transuranic waste which I am also committed as the Secretary of Energy to move, and I would not like, as I think many others would not like, to refocus that site for any other than the purpose that we have now started to characterize it. We are too close to begin another dialogue on that. I would be inexorably opposed to looking at that site for anything other than the WIPP, strongly opposed.

Mr. MYERS. But other sites, though, other sites were under consideration. That is not the only cavern.

Secretary O'LEARY. I understand, Mr. Myers. What I would like not to do today, with your permission, is to engage in this debate. First of all, I have not looked at this record since 1990. I need to go back and refresh myself on that record.

Mr. MYERS. Sure, okay, I understand that.

Secretary O'LEARY. Thank you.

Mr. MYERS. Mr. Bevill, do you have some more questions?

ENERGY INDEPENDENCE

Mr. BEVILL. Just a quick one. The Congress set up the U.S. Department of Energy back during the Carter administration when we had the gasoline lines formed, and certainly I think we have come a long way since then, but our goal really, the bottom line, as we say, is to make this Nation energy-independent, isn't it?

Secretary O'LEARY. I have not expressed that language in a very long time.

Mr. BEVILL. There wouldn't be any harm in your saying that, would there?

Secretary O'LEARY. Earlier, when you said, I guess that is the best answer I am going to get from you, it is because I was there.

I have been there for project independence, I was there for—I can't even remember the names of the studies that——

Mr. BEVILL. What problems do you have with becoming energy-independent?

Secretary O'LEARY. Mr. Bevill, I don't know, given today's budget constraints, that I could articulate that as a goal and deliver on it. I think our goal here today, and one of the reasons that I have been so pleased at the expansion of our international work, is to begin to look at how we, as we move forward, provide more balance to our vulnerability by reaching out.

I mean, the Venezuelans have been our long-time friends, supporters and suppliers. The same is true of Mexico. Of course, I would like to look forward to the day when we have got geothermal plugged in and all of this is working.

Mr. BEVILL. Well, you know that our country is vulnerable as long as it is not energy-independent.

Secretary O'LEARY. I understand that.

Mr. BEVILL. So without your risking it by saying that you are seeking to have energy-independence, I see no harm in that.

Secretary O'LEARY. Well, I need to be a little more careful than that because I remember the history, and you will forgive me for trying to be more careful. If you would let me express it in this way: I want to ensure that we have the most diverse supply of energy, that it is secure, that it is economic, meaning affordable within the real cost to find it, to bring it to market, and I want to drive the heck out of our ability to increase efficiency in all of our energy use, and that is how we get independent.

OIL IMPORTS

Mr. BEVILL. If I may, just another quick question here. In your annex that you added there, I was hoping you would say in there how much you were talking about the oil imports. How many barrels, how many million barrels of oil a day are we importing now? It used to be 8 million. Would that help you?

Secretary O'LEARY. Fifty-one percent of our requirements are now imported if one includes both crude and the refined product. I apologize for not remembering the number.

Mr. BEVILL. That is not anything for us to be proud of.

Secretary O'LEARY. I am not proud of it at all. The projection when I came here is it will go to 60 before I am out of the job, which is why I need all of this energy efficiency money that I am asking in this alternative.

Mr. BEVILL. Whose projection is that?

Secretary O'LEARY. It comes out of our Energy Information Administration, but it is not unlike the projections that are coming out of the international——

Mr. BEVILL. If you will, please, put in the record how many million barrels of oil we are importing today, will you do that please?

Secretary O'LEARY. Yes, sir, I will.

[The information follows:]

OIL IMPORTS

In 1994, U.S. gross imports of crude oil and petroleum procedures were 8.929 million barrels per day. Net of exports, the average in 1994 was 7.896 million barrels per day.

Mr. BEVILL. Thank you. Very good. I support the U.S. Department of Energy for your information.

Secretary O'LEARY. Thank you, sir.

STRATEGIC PETROLEUM RESERVE

Mr. MYERS. Thank you, Tom. As a matter of fact, there are a lot of reasons why we want to develop our own ability to produce our own oil. But for financial security today, if we preserve ours and use someone else's and as long as the price is competitive, there is every reason why we should preserve not an unlimited resource, not a renewable source, but save it for our children and grandchildren. It is a happy balance here, that is the reason why I am not in favor of selling the national petroleum reserve; never have been. It was put there as a national security. We don't need the money that badly, even though we are in trouble. But nevertheless——

Secretary O'LEARY. I have a feeling I need a lot of money very badly, Mr. Chairman.

Mr. MYERS. We are going to try to help you on that.

Mr. Frelinghuysen.

CONTRACT REFORM FOR ENVIRONMENTAL CLEANUP WORK

Mr. FRELINGHUYSEN. You are turning to the wrong person, Mr. Chairman. I want to get back to the issues of management. You spoke in your testimony of reforming the contracting system at the Department.

Secretary O'LEARY. That is right.

Mr. FRELINGHUYSEN. Could you tell me what the average administrative costs are for contracts, let's say in the clean-up area?

Secretary O'LEARY. The average administrative costs are approximately 10 to 15 percent, and the reason I am having trouble focusing on that is because I would have to count the Administration both within the Department, which we do count and I can come up with a very firm figure. Then within each one of these contracts there are management requirements from the contractor himself, and so I am in a position to tell you I cannot give you that figure. There are others in the room who likely can. If they can, then they should tell me, and if they cannot, I will provide it for the record.

Mr. FRELINGHUYSEN. I would like to know what the average administrative costs are for a clean-up project and whether you have the ability or the people who were subordinate to you to cap some of those costs if, in fact, the determination has been made that things appear to be somewhat excessive.

Secretary O'LEARY. The way we have approached contract reform is to, quite frankly, not look at the individual costs, but to drive down overall costs and to invest the contractor himself in accomplishing savings so as not to pay an award fee. This had been the case before we took the job for spending more money, but actually put the contractor in a position to save money and therefore earn rewards.

So I have not approached it in the way you have, segment by segment, but more importantly asked for performance in terms of cleanup and performance in terms of accomplishing the restoration work that these contractors have been asked to perform. I understand your point and I will take a look at it.

Mr. FRELINGHUYSEN. Performance is all good and proper, and that is desirable, but I assume that there must be some general administrative costs and some direction from you to hold down administrative costs. Certainly that we want to have a desirable——

Secretary O'LEARY. Indeed there is.

Mr. FRELINGHUYSEN [continuing]. End.

Secretary O'LEARY. The point to make here is if one includes facilities, the management of facilities, and over time there is clear guidance with respect to how that work should be done, but, again, I am moving the other way with very general guidance and not trying to lay on 50 pages of orders with respect to how one saves money, but I understand the information you want and I will provide it for you. It is readily available and I think I have given you clearly that information from the Department's perspective.

[The information follows:]

AVERAGE ADMINISTRATION COSTS FOR ENVIRONMENTAL RESTORATION AND WASTE MANAGEMENT PROJECTS

In a detailed study performed for the Department in November 1993, the average administration costs -- or project management costs -- for environmental restoration and waste management projects were estimated to total approximately 23% of total project costs. Such project management costs were defined in the study as the management costs charged to a project by the Department's management and operating contractors and onsite architectural and engineering contractors, and included costs for supervision and inspection, salaries and wages, non-construction supplies, and training.

The Department currently is working with its contractors to review project management costs and identify areas where these costs should be reduced. We are reviewing our contracts to ensure that:

> Project support/overhead, such as directly assigned staff, information management, maintenance, engineering, security, G&A, utilities, etc., are evaluated to benchmark existing practices and performance standards, and to identify areas where productivity/efficiency gains and cost savings may be achieved.
>
> Project support/overhead best practices and performance standards from DOE, other Governmental agencies, and industry are reviewed for applicability and implemented where appropriate.
>
> Cost effective approaches to providing services (such as user pay versus funds allocation, make versus buy, value engineering, lease versus purchase, etc.) are appropriately implemented, and unnecessary and redundant activities and services are eliminated.
>
> Contracts have productivity/efficiency performance measures with quantitative performance standards and positive and negative incentives for contractors.
>
> In the event of unsatisfactory contractor performance, contracting alternatives, which could include the use of other governmental agencies, are established so that EM can acquire the most cost effective services.
>
> Prime contractors clearly establish technical objectives, cost and schedule objectives, and accountability that extend down through all subcontract tiers.
>
> Contracts undergo periodic reviews to ensure that the performance measures and criteria are consistent with current best practices.

HEADQUARTERS AND FIELD OVERHEAD

Mr. FRELINGHUYSEN. Madam Secretary, I would like to focus on pages 100 and 101 of your fiscal year 1996 congressional budget request titled, Management and Other Activities. Why are there two sections here, headquarters support and operational office support? The budget request for headquarters is a staffing level of 1,924 to support the headquarters staff. The operational office support provides a staffing level of 1,143 to support 2,165 Federal employees and perform oversight activities performed by 56,800 management and operating contractor employees, and in each of these areas the budget reflects funding to support staff, contractual support, and capital equipment. It seems to me, reading over these narratives here, that there is a tremendous amount of repetition and duplication. Why is it necessary?

Secretary O'LEARY. That is just the point I made earlier, sir. This is why we are going through this realignment exercise to get at just this piece and what you will have at the end of April is a clear indication not only of where the redundancies are but the costs.

I testified to this earlier. This is exactly what we are after, and the reason the budget is put together this way is because it always has been, and it will not be next year.

Mr. FRELINGHUYSEN. This confirms the past practice?

Secretary O'LEARY. Exactly. My point to you is this will not be done this way next year. This is work I have going on now for four months and planning for some six months.

Mr. FRELINGHUYSEN. In terms of labor relations, travel, logistical services, printing, we would look forward at some point in time to a potential consolidation of these efforts?

Secretary O'LEARY. Yes, consolidation and reduction of both the cost and the people doing the work. You put your finger on just the thing I was testifying to earlier. There is not only a headquarters office, but there is a site office and a field office.

Mr. FRELINGHUYSEN. This is an unbelievable list of things here.

Secretary O'LEARY. They are there in every budget.

Mr. FRELINGHUYSEN. I am not sure that that necessarily makes me happy.

Secretary O'LEARY. It hasn't made me happy, which is why I have gone after it, sir.

Mr. FRELINGHUYSEN. All right. Thank you, Mr. Chairman.

RESCISSIONS

Mr. MYERS. Madam Secretary, we have a couple more questions here I will ask, then we have a series of questions we are going to put in the record as usual.

First, you have said we are wrong in rescinding some of the money from the energy management or the environmental management. The other day in full committee there was another $28 million taken from the defense environmental restoration waste account.

Now, a couple letters we received were unclear. They were critical of the nondefense, but did not seem to be critical of taking money from the defense cleanup. Can you tell me how damaging that was, $28 million, are we going to lose another 40,000 people?

Secretary O'LEARY. I don't know why Mr. Grumbly didn't write a letter. I suspect after this hearing he will.

Mr. MYERS. He will if you tell him to.

FACILITY TRANSFER

Secretary O'LEARY. Let me tell you my concern and I will go back to a real life example. What we found as I began to understand and do my own visit of these sites is that more often than not, when the transfer was taking place between the Defense Programs and the Environmental Management Programs, because one takes responsibility for a site I now move it if I am the Assistant Secretary for Defense Programs and I give it to the Assistant Secretary for Environmental Management.

Often, as a matter of budget stringency, the transferring Assistant Secretary will suddenly decide, I am about to unload this site. Maybe I can back off of expenditures so that when I hand it over I have saved a bit of money. Well, it may help that transferring Assistant Secretary, but it does not help the receiving Assistant Secretary, and I will cite you an example of, not that someone has told me, but I have seen facilities and buildings where the door has simply been locked, the lights have not been turned off, and nothing has been done to prepare that building for decontamination or decommissioning and nothing has been done over several years to keep that building in some sort of shape so that it is not a deteriorating structure when it is received.

This is the condition that we find many of our sites that have been in this transient phase and what it does is it further exacerbates the expense now that the Environmental Management program must pick up as we have a decaying building, a building in which no preliminary work has been done, and often the case is we have a building for which there is no record with respect to its architectural design, with respect to its electrical equipment, and we are bumbling around in the dark trying to figure out how to decontaminate a building and there is not a record in existence.

Mr. MYERS. Are these defense activities you are speaking about now?

Secretary O'LEARY. Yes.

Mr. MYERS. When they said we had too much money in the full committee I tried to help you, but I didn't get much help.

Secretary O'LEARY. I want this help, but I will tell you we have attempted to begin to set up an orderly transition so that this does not happen. This was a common practice in the past. I have been into buildings and seen the light bulbs still shining in a glass wall behind a facility where plutonium was being moved, and the whole system is just frozen with the light bulb on.

In the private sector that would never occur. It is unconscionable. Now, I cannot tell you or Vic Reis what the downside is or if there is one, but I will go back today and ask him for that examination. I have seen the result of very careless transfer of facility from one responsibility to the next. It costs the taxpayer, and it is dangerous to our workers.

SUPERCONDUCTING SUPER COLLIDER

Mr. MYERS. What is the status of the SSC now?

Secretary O'LEARY. The SSC, I will not use the language that I read last night. It is demobilizing on target. We are moving on schedule to disengage from that site. We have reduced the number of contractors dramatically.

My recollection having read those numbers just last night is that we are down to approximately 650 contractor employees. Our relationship with the State of Texas now reduces itself to an agreement. We are transferring title to land to them, and in point of fact I am very pleased with the fact that we are on budget save a few elements of land and buildings which have not yet had formal transfer.

Mr. MYERS. You even pay them to take it. That is the best thing for them, I guess.

Secretary O'LEARY. Well, sir, that is the negotiation that I entered into, and I believe we saved the taxpayer some money in the way we negotiated it. We are on budget. We are on pace, and things are moving as we predicted.

INTERNATIONAL OFFICES

Mr. MYERS. In the discussion earlier with Mr. Frelinghuysen, you are going to provide a list, I understand, with a list of the Department of Energy Facilities in the United States. How about in Tokyo and Moscow, where else do we have overseas?

Secretary O'LEARY. In point of fact we do not have any freestanding Department of Energy offices overseas, but we do have Department of Energy technical experts on site. We have them in Tokyo, we have them in Vienna, Geneva as well as in Paris. When I was younger, it used to be where people got sent to do hard duty. We also have them in Russia.

Normally, they are supporting the work of Department principals moving in and out of programs that have been dictated and are contained in budget. In Vienna we support the work of the International Atomic Energy Agency, which is extremely important as we go about trying to ensure nonproliferation. In Russia we support the work we are doing with the Russians both on the Nunn–Lugar as well as the work we are doing on nuclear safety and we support the work we are doing on nonproliferation, indeed in the technical institutes where we have done a great job in helping them set up control management and accounting systems for fissile material.

RUSSIAN REPLACEMENT POWER INITIATIVES

Mr. MYERS. We have two new requests this year, as I recall the nuclear reactor for Russia of $78 million, I believe, then $5 million for licensing or something. There are two new accounts that we haven't had in the past. Can you explain what those programs are?

Secretary O'LEARY. I can indeed. I am blocking on the licensing, so let me talk about the one I know I can talk about.

Mr. MYERS. Oh, it is power replacement.

Secretary O'LEARY. Oh, absolutely. This effort is to live up to our commitment made to the Russians when they entered an agreement, President Yeltsin for the Russian government and President Clinton for the United States Government to close the most dangerous weapons productions reactors at Krasnoyarsk and Tomsk.

These are reactors without containment, very much like the reactor at Chernobyl, that present tremendous risk to the West, to people of the west and east of these reactors. What we did last year was negotiate an agreement with the Russians that they would close down those reactors by the year 2000.

The difficulty from the Russians' perspective is not only do they use those reactors for the—or have they used them for the production of fissile material for weapons, but they also use them for heat and electricity for the towns and the regions in which these two reactors were sited.

What we now work with the Russians on is finding a viable alternative for this nuclear power and trying to assist them in coming up with a feasibility study that will permit funding and international markets for the replacement power while Russia struggles to find its own hard currency to pay for that work.

In my mind, it is critical that this work be done. It leads to the work also being done with the Ukrainians at Chernobyl where we seek to close down all of those inherently dangerous and unsafe reactors. I do remember the other account, and the other account is to work traditionally on the safety of those less dangerous reactors, which will not now be replaced in the next 10 to 15 years, for which training is required for the operators, for which safety systems to prevent fire is necessary, and most importantly to establish a regulatory regime so we can have some certainty that these reactors, that are not up to western standards but will be operating nonetheless, will be operated as safely as humanly possible. I believe it is important money to spend.

NUNN-LUGAR ACT

Mr. MYERS. Why couldn't the money, $5 million come out of the Nunn-Lugar?

Secretary O'LEARY. On the issue involving the civilian work, as I understand it, and I will tell you I have not carefully read that legislation, is that the Act does not permit it, and that is why it is coming out of the Department of Energy account. You may believe that all work we can find and identify to be done under Nunn-Lugar, we are doing that and we are also crafting an agreement with our colleagues at the Defense Department to support as much of this work that is permitted under the act.

[The information follows:]

NUNN-LUGAR FUNDS

The Nunn-Lugar Act does not apply to the Russian replacement power initiative. The Department of Defense has interpreted the Nunn-Lugar legislation to apply only to the destruction or dismantlement of weapons of mass destruction.

STRATEGIC REALIGNMENT EFFORT

Mr. MYERS. My last question, a moment ago you questioned my characterization of the Galvin Report as being critical, so I will put it this way. The Galvin Report questioned the necessity for unnecessary oversight and regulations throughout the Department of Energy as far as operating the labs.

Secretary O'LEARY. I absolutely agree with the oversight and understand, I mean, I need to keep saying this. I asked for the Galvin Report.

Mr. MYERS. Yes, I know.

Secretary O'LEARY. To inform the work that I am doing and to support the work I am doing that I have discussed generally today.

Mr. MYERS. How many layers are you going to eliminate?

Secretary O'LEARY. Sir, as many as I possibly can.

Mr. MYERS. Can we help you?

Secretary O'LEARY. I think that I am going to do the job that you want me to do, and I also believe that I will do it in a quality way. We have often in the Department taken people out and simply replaced them with contract employees because we have never examined what the work is, what work is required, what work is desired, and what work we were doing 20 years ago for which there is no customer today. That is what I am doing, and I will be pleased to testify before you after April. I hope you will invite me up.

If you think I am not doing a good job, help me some more. But I need to lay in the planning for this so that it is thoughtful, and we won't be back door filling in as we have year after year with contractor employees to replace the full-time Federal employees that we have so that now we are seven contractor employees to one Federal employee. That is insanity.

Mr. MYERS. I suspect we will have to visit again because, as has been mentioned here, Mr. Kasich has the responsibility of drafting a budget. We have that ceiling, and my guess is, I am just guessing here, that your ambitious requests here will not be under the ceiling placed on it by the Budget Committee, so we may have to revisit again so keep your pencil sharp.

Secretary O'LEARY. I will very much look forward to seeing you, Mr. Chairman, and members of the committee. Thank you very much.

Mr. MYERS. We always appreciate seeing you, but I don't know if you are looking forward to it. I am not going to go that far. I think we will probably have to visit again. A number of us have additional questions, as we always do. We thank you for your testimony today. We look forward to working with you.

Secretary O'LEARY. Thank you, sir. I do, too. Thank you very much.

Mr. MYERS. The committee will stand in adjournment until 10:00 tomorrow morning.

[The prepared statement of Secretary O'Leary and questions and answers for the record follow:]

GENERAL

Mr. Myers. The Department of Energy was established largely in response to widespread concerns about the energy security of this country. Do such concerns continue to be valid today? How would you characterize the current energy situation in this country? Have we become too complacent? Is there an energy crisis in our future?

Secretary O'Leary. The Department of Energy must continue to work toward improving the nation's energy security. As you are aware, a recent study by the Department of Commerce concludes that this nation's reliance on imported oil continues to pose a threat to national security. At the time of the oil crisis of 1973, the U.S. was dependent on imports for 35 percent of our oil. In 1991, at the time of Desert Storm, we imported 40 percent of our oil. The U.S. is now reliant on imports for over 45 percent of domestic consumption (net imports). These increases and imports have come largely from Saudi Arabia. In 1987, we imported 751 million barrels per day (11.2% of total imports) from Saudi Arabia. Today, we import 1,402 million barrels per day (15.7% of total imports) from that country, a two-fold increase. If current trends continue we will be relying on foreign sources for an estimated 59 percent of our oil in 2005. Our dependence on foreign oil leaves the U.S. economy vulnerable to the international developments including oil price and supply fluctuations and changes in the political situation in the Middle East.

With the cost of imports amounting to between $40 and $50 billion annually, our trade deficit has increased dramatically in recent years. Oil imports account for approximately 40 percent of this deficit. The recent fall of the dollar's value has come in part in response to this growing trade deficit. These developments have a profound impact on the nation's economy.

In terms of an energy crisis, the nation is in some ways less vulnerable to oil price spikes than it was in 1973 or 1979, as a result of the establishment of the Strategic Petroleum Reserve, the decontrol of oil prices, improved energy efficiency, and the diversification of our energy supply. In addition, OPEC members, particularly Saudi Arabia and Venezuela, have acquired large stakes in the U.S. refining and marketing sector in cooperation with domestic firms, securing outlets for their oil supplies and generating profits for their national petroleum concerns. Nevertheless, the world's oil reserves are increasingly concentrated in the volatile region of the Persian Gulf, and the nation's energy security will be improved by actions the Department is taking to lower US dependence on oil imports.

The Department continues to assist the domestic oil industry in the development of advanced technologies for exploration and drilling. We continue to conduct research with the big three automakers aimed at developing an 80 mpg automobile in order to curtail the nation's demand for oil. We have requested continued funding for alternative fuel vehicles and the development of biofuels. These measures are expected to have a profound effect on the energy security of our nation. We oppose the rescissions the Subcommittee has proposed in FY 1995 funding of these measures.

More dramatic measures could further reduce the chances of a future oil crisis, but these measures carry a high price in terms of government spending, taxation, or regulation, or in environmental risk. Whether due to complacency or competing values, the public is not willing to pay this higher price.

DEPARTMENT OF ENERGY PANELS

Mr. Myers. You have directed a review of the Department's organizational structure and a review of the applied research and development programs. Can you share any conclusions which have been reached by either of these panels?

Secretary O'Leary. In December, 1994, we initiated a Strategic Alignment Initiative as part of a four month analysis of the deployment of the Department's human and organizational resources. It is an employee driven exercise which will scrutinize the present deployment of the Department's resources and recommend ways to restructure the Department to serve its customers better for less. This group will report to the Secretary at the end of April with recommendations on how the Department should be organized and how it can substantially reduce the cost of doing business.

The Yergin Task Force, chaired by Pulitzer Prize winning author Daniel Yergin, is holding public meetings with the scientific community and industry to develop recommendations to improve the focus of the Department's applied research programs. The Yergin group will issue preliminary findings in April. Their efforts concern bringing our research priorities more in line with those of industry.

FUNDING FOR ACTIVITIES WITH RUSSIA

Mr. Myers. Please identify all areas in the budget where funding is provided for activities with Russia or countries which were part of the former Soviet Union.

Secretary O'Leary. The Department is requesting $199.5 million for activities with Russia or countries which were part of the former Soviet Union. The funding is shown by Appropriation/Program in a table which I would like to insert for the record. The information follows:

Energy Supply Research & Development:

Soviet Designed Reactor Safety Program - $78.8M
Continue DOE's effort to reduce risk of accident from nuclear reactors, primarily in Russia and Ukraine, by infusing them with Western hardware and safety standards. Program focuses on management and operational safety efforts; plant safety evaluation efforts; engineering and technology activities; fuel cycle safety work; legislative and regulatory framework support; resolution of technical and socio-economic issues delaying Chernobyl shut down; and safety efforts in other Former Soviet Union states.

Russian Replacement Power Initiative - $5.0M
Enable Russia to shut down plutonium production reactors by helping it select an alternative power source and find international financing to provide for it.

Nuclear Technology R&D - $5.15M
Conduct R&D to advance the current state of safety technology to the next generation, especially for Soviet-designed reactors.

Environment, Safety & Health - $6.8M
Conduct studies of radiation exposure outside the Chernobyl area. Program supports G-7 working group initiative and 1994 Bi-national Agreement with the Russian Federation.

Biological and Environmental Research - $0.1M
Supports twenty small grants at $5,000 each to highly skilled Russian research teams primarily at Institutes in Moscow, St. Petersburg, and Novasibirsk dealing with molecular genetics, cellular biology, and biophysics. Active collaborations have also been established with DOE's human genome program at Argonne National Laboratory, Los Alamos National Laboratory, Lawerence Livermore National Laboratory, and Oak Ridge National Laboratory.

Fusion Energy - $0.75M
Provides support to Russian Federation scientists working in the United States, U.S. scientists working in the Russian Federation, and subcontracts with the Russian Federation.

Uranium Supply & Enrichment Activities - $7.2M

Monitor Russian uranium to ensure that low enriched uranium purchased from Russia by the U.S. is derived from highly enriched uranium taken from dismantled weapons.

General Science and Research:

High Energy Physics - $0.35M

Procure special magnets for DOE's B-factory being built at the Stanford Linear Accelerator Center. This effort is part of a scientific collaboration with Soviet scientists who are helping to design the magnets. Funding primarily pays for magnet materials.

Departmental Administration - $0.3M

Oversee DOE efforts to promote defense conversion and stabilization of the Newly Independent States and improve coordination on all DOE research and development and technology transfer programs with the Department of State and the U.S. Embassy in Moscow.

Defense Environmental Restoration and Waste Management:

Technology Development - up to $0.2M

Identify and access Russian technologies, technical information and scientific research relating to environmental management.

Other Defense Activities

Arms Control - $94.7M

Provide for initiatives to develop a national system of nuclear materials protection, control and accounting (MPC&A) systems and a national MPC&A training center, and to improve the current MPC&A systems at many Russian sites; conduct an Industrial Partnering Program to redirect the activities of scientists and engineers from the Newly Independent States (NIS) to nonmilitary scientific and commercial R&D, provide business education and assistance to the commercial R&D projects, and support a partnership between DOE laboratories and NIS institutes to increase U.S. industry investment in the NIS; provide assistance to Former Soviet Union states to effectively control nuclear exports; establish transparent and irreversible nuclear reductions; provide additional funds in Negotiations & Analysis for "Secure Former Soviet Union Nuclear Materials and Expertise"; shut down production reactors; and provide technical means to reduce the uranium enrichment used in research and test reactor fuels.

Energy Conservation

Technical and Financial Assistance - $0.1M
Assist the training of energy decision makers; identify market opportunities; assist U.S. energy efficiency firms export products and services; and provide information on U.S. sustainable market development technologies to local entities through coordinated U.S. databases.

WEAPONS LABORATORIES

Mr Myers Why does the country still need three weapons laboratories to support the much reduced nuclear weapons stockpile?

Secretary O'Leary The challenge before the DOE and its laboratories is not the smaller stockpile, but rather how to maintain confidence in the safety and security of the stockpile without underground testing This will be accomplished through the Stockpile Stewardship/Stockpile Management Program This program is a major scientific and technical challenge, one that will require the talents and skills of scientists at all three laboratories The precise roles of the three laboratories are still being defined The Department supports the study of a careful phase-down of some of Lawrence Livermore's nuclear weapons work, combined with a reemphasis on non-proliferation, counter-proliferation, and verification activities Timing and details of phase-down will depend on assessment of how best to meet continuing national defense requirements in absence of testing Alternative methods of retaining peer review will be examined to provide basis for any decisions.

WEAPONS LABORATORIES

Mr Myers Are you supporting the Galvin report's recommendation to phase out weapons design work at Lawrence Livermore National Laboratory?

Secretary O'Leary The Department supports the study of a careful phase-down of some of Lawrence Livermore's nuclear weapons work provided we can ensure the safety and maintenance of the stockpile At the same time, we want to reemphasize activities associated with nonproliferation, counter-proliferation, and verification activities. Timing and details of phase-down will depend on an assessment of how best to meet continuing national defense requirements in the absence of testing

STOCKPILE STEWARDSHIP

Mr Myers. Madam Secretary, the Committee is familiar with the Department's plan to develop a science-based stockpile stewardship program to maintain this country's nuclear weapons stockpile. This is to compensate for the lack of underground nuclear testing Now that the President has extended the nuclear weapons testing moratorium indefinitely, can you assure this Committee that the nuclear weapons stockpile is safe and that it will remain so?

Secretary O'Leary. I can assure the Committee that the current stockpile is safe, secure and reliable In announcing the continuation of the nuclear testing moratorium in 1993, the President directed the Department to establish a program to maintain a high level of confidence in the safety, reliability, and performance of the nuclear deterrent This challenge was codified when the Congress passed the FY 1994 National Defense Authorization Act that directed the establishment of a "stewardship program to ensure the preservation of the core intellectual and technical competencies of the United States in nuclear weapons" To meet this challenge, the Department has developed the Stockpile Stewardship and Management program This program will enable the laboratories and plants to remain current in all appropriate research foundations and critical skills necessary to develop and maintain the infrastructure and technical capabilities required to support the enduring nuclear weapons stockpile The Department has several major initiatives in the FY 1996 budget to meet the objectives of the Stockpile Stewardship/Stockpile Management Program. the National Ignition Facility, the Accelerated Strategic Computing Initiative, a new tritium source, and the Los Alamos Neutron Scattering Center.

STAFFING REDUCTIONS

Mr Myers. How will the government-wide reduction in Federal employees impact DOE in fiscal year 1995 and fiscal year 1996? Please describe actions taken to comply with the reductions including the number of employees who left in fiscal year 1994 and to date in fiscal year 1995 and the cost for each employee reduction.

Secretary O'Leary The following table provides full-time equivalent information by major DOE Office and program The Department's full-time equivalent target increased by 131 from fiscal year 1994 to 1995 and by 290 from fiscal year 1995 to 1996 The Department offered 600 buyouts in fiscal year 1994 at an average cost of $23,000. The buyouts were used as a management tool to downsize lesser priority programs and provide flexibility to increase employment in Environmental Management We are currently concluding a Departmentwide Strategic Alignment Initiative and will begin implementation shortly. Staffing reductions resulting from this effort will be achieved through buyouts and attrition The Department's allotted full-time equivalent reductions begin in fiscal year 1997.

Mr. Myers. By location (city and state), please identify every DOE office located in the United States or foreign countries. For each office for fiscal years 1994, 1995, 1996, provide the number of employees, the funding to maintain the office staff and office space, and the programmatic funding administered by each office. Also, for all offices other than DOE operations offices and power marketing headquarters offices, provide a brief description of the activities and programmatic functions of each office. Also, for all offices other than DOE operations offices and power marketing headquarters offices, provide a brief description of the activities and programmatic functions of each office.

Secretary O'Leary. The following table show full-time equivalent information by office and location for fiscal years 1994, 1995, and 1996. Funding data was not readily available in the format requested and will be provided in the near future. (The information follows:)

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Full-Time Equivalents and Funding for Department of Energy Field Facilities

	---Full-Time Equivalents---			
Organization	FY 1994 Usage	FY 1995 Cong Req	FY 1996 Cong Req	Comments
Secretary of Energy Adv Board	0	9	9	
Congressional & Intergovernmental Aff				
Environmental Restoration Increase		2		
Congress & Intergov	65	70	72	
Nuclear Waste Fund	2	3	3	
Total	67	75	75	
Chief Financial Officer				
Chief Financial Officer	290	278	277	
Nuclear Waste Fund	3	3	3	
Total	293	281	280	
Defense Programs				
Stockpile Support	35	27	184	
Weapons Program Direction	148	124	154	
Stockpile Mgt				
General Mgt	5	4		
Program Support	107	81		
Materials Support	153	100	0	
Total	448	336	338	
Economic Impact & Diversity	59	56	60	
Energy Efficiency & Renewable Energy				Includes Atlanta, Boston, Chicago, Dallas, Denver, Kansas City, New York, Philadelphia, San Francisco, and Seattle Regional Support Offices
Solar Energy	60	65	76	
Geothermal Energy & Hydro	11	13	13	
Electric Energy & Storage	10	15	15	
General Mgt - Energy Supply R&D	5	5	5	
Program Support - Energy Supply R&D	24	26	26	
In-house Energy Mgt		6	6	
Buildings	66	81	82	
Industry	46	60	60	
Transportation	55	71	72	
Utility		9	9	
Tech & Financial Assist	248	258	257	
General Mgt - Energy Con	3	3	3	
Program Support - Energy Con	30	37	36	
Total	558	649	660	
Environment Safety & Health				
Environmental R&D	279	360	364	
EH- General Management	7	7	7	
EH- Program Support	29	11	11	
Weapons Program Direction	2			
Nuclear Safety Oversight	73	73	73	
Security Evaluations	29	32	32	
Nuclear Waste Fund	0	2	2	
Total	419	485	489	
Energy Information Administration				
Nuclear Waste Fund	3	3	3	
National Energy Info System	460	483	479	
Total	463	486	482	
Environmental Restoration & Waste Mgt				
Environmental Restoration	128	149	130	
Waste Management	158	168	147	
Technology Development	93	72	63	
Facility Transition	51	81	72	
General Management	1	61	53	
Program Support	202	210	279	
Tech Leadership Devcp Program		50	6	
Environmental Mgt	0	31	484	
Total	633	822	1234	
Energy Research				
Biological & Env Research	60	62	62	
Fusion Energy	61	61	61	
Basic Energy Science	71	77	78	
Advisory & Oversight	91	82	79	
General Management	15	18	18	
General Science Prog Direction	48	55	56	
Superconducting Super Collider	39	4	0	
Total	385	359	354	
Science Education & Technical Info				Includes Office of Scientific & Technical Information
Advisory & Oversight	26	25	25	
Science Educ & Tech Info	164	169	167	
Total	190	194	192	

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Full-Time Equivalents and Funding for Department of Energy Field Facilities

Organization	---Full Time Equivalents--- FY 1994 Usage	 FY 1995 Cong Req	 FY 1996 Cong Req	Comments
Fossil Energy				
Liquefied Gaseous Fuels	1			Includes Metarie Site Office
Clean Coal Technology	22	24	23	
ETC Technical Prog Direction	4	6	6	
HQ Technical Program Dir	91	90	91	
General Mgt	7	7	7	
Program Support	22	24	24	
Fuels Program	27	24	24	
Naval Petroleum Reserves	18	19	19	
SPR Storage & O&M	38	36	36	
Total	230	230	230	
Associate Deputy Secretary for Field Mgt				
Environmental Mgt increase		7		
Field Management	88	92	99	
Employee Concerns Program	0	0	6	
Total	88	99	105	
General Counsel				
Environmental Mgt increase		7		
General Counsel	153	162	181	
Nuclear Waste Fund	6	3	3	
Economic Regulatory Administration	53	49	29	
Total	212	221	213	
Hearings & Appeals				
Board of Contract Appeal	6	8	8	
Hearings & Appeals	82	81	81	
Total	88	89	89	
Human Resources & Administration				
Science & Eng Rec, Training	22			
Secretary of Energy Adv Board	7			
Environmental Mgt Increase		11		
Human Resources & Administration	966	944	920	
Nuclear Waste Fund	10	7	7	
Total	1,005	962	927	
Inspector General	358	356	356	
Fissile Materials Disposition				
Materials Production	0	29	30	
Nuclear Energy				
Nuclear Energy R&D	95	80	85	
Gen Mgmt	6	7	7	
Program Support	54	33	33	
Uranium Enrichment	33	10	19	
Isotope Support	6	6	12	
Naval Reactors Development	60	60	60	
Total	254	196	216	
Nonproliferation and National Security				
Emergency Mgmt	27	29	30	
Arms Control	57	44	49	
Research & Development		11	11	
Nuclear Safeguards & Security	144	136	149	
Intelligence Activities	86	69	77	
Energy Emergency	39	41	41	
Total	353	330	357	
Public Affairs				
EM Increase		1		
Departmental Admin	56	54	55	
NWF	1	1	1	
Total	57	56	56	
Office of Policy				
Environmental Analysis	18			
EM Increase		2		
Departmental Admin	159	193	192	
Energy Emergency	26	26	25	
Total	203	221	217	
Quality Management	0	12	12	
Federal Energy Regulatory Commission	1,434	1,463	1,453	
Office of the Secretary	29	30	30	
DUS for Technology Partnerships	0	18	19	
Worker & Community Transition				
Weapons Activities		10	18	
Environmental Mgmt		5		
Departmental Admin		3		
Total		18	18	

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Full-Time Equivalents and Funding for Department of Energy Field Facilities

	---Full-Time Equivalents---			
Organization	FY 1994 Usage	FY 1995 Cong Req	FY 1996 Cong Req	Comments
Albuquerque Operations Office				Includes Amarillo Area Office, Carlsbad, Kansas City Area Office, Kirtland Area Office, Los Alamos Area Office, Pinellas Area Office
Weapons RD&T	92	100		
Stockpile Support	787	749		
Weapons Prog Dir - Defense Prog	557	500	505	
Stockpile Management			741	
Stockpile Stewardship			100	
Environmental Restoration	60	104	104	
Waste Management	60	128	133	
Technology Development - Envir Mgt	15	19	19	
Industry	2	2	2	
Total	1,573	1,602	1,604	
Alaska Power Administration	33	35	35	
Bonneville Power Administration	3,596	3,440	3,325	
Bartlesville Project Office	24	27	27	
Chicago Operations Office				Includes Argonne Area Office, Batavia Area Office, Brookhaven, Environmental Measurements Lab, New Brunswick Lab, Princeton Area Office
Nuclear Energy R&D	12	13	13	
Biological & Env Research	88	88	88	
Fusion Energy	18	19	19	
Basic Energy Sciences	5	7	7	
Gen Science Prog Direction	14	18	18	
Environmental Restoration	14	36	39	
Waste Management	11	22	22	
Technology Development - Envir Mgt	4	5	5	
Facility Transition		1	1	
Nuclear Safeguards & Security	65	64	64	
Chicago Ops Office	329	319	318	
Industry	6	5	5	
Tech & Financial Assistance	4	3	3	
Total	570	600	602	
Civilian Radioactive Waste Management				Includes Yucca Mountain Site Characterization Project Office
Civ Radioactive Waste R&D	2	2	2	
Nuclear Waste Fund	181	185	220	
General Management	4	4	4	
Program Support	29	29	29	
Total	216	220	255	
Golden Field Office				
Solar energy	11	32	32	
Prog Support (Energy Supplly R&D)	2			
Industry	2			
Tech & Financial Assistance	14			
Program Support Energy Con)	7	10	10	
Total	36	42	42	
Idaho Operations Office				
Geothermal Energy & Hydro	2	2	2	
Nuclear Energy R&D	1	1	1	
Environmental Restoration	34	35	35	
Waste Mgt	149	146	147	
Technology Development - Envir Mgt	13	14	14	
Facility Transition	71	80	80	
Arms Control	1			
Naval Reactors Development	10	10	10	
Idaho Ops Office	172	168	168	
Nuclear Waste Fund-Civ Rad Waste Mgt	5	2	2	
Industry	4	4	4	
Total	462	462	463	
Morgantown Energy Technology Center				
Technology Development - Env Mgt	10	14	14	
Clean Coal Technology	29	29	27	
Direct Staffing	98	92	91	
Technical Program Direction	194	182	182	
Total	331	317	314	
Casper Naval Petroleum Reserve	14	14	14	
Elk Hills Naval Petroleum Reserve	52	43	43	
Nevada Operations Office				
Liquefied Gaseous Fuels	1			
Weapons RD&T	167	160		
Weapons Program Dir - Defense Programs	173	171	170	
Stockpile Stewardship			150	
Environmental Restoration	15	32	34	
Waste Mgt	12	24	24	
Technology Development - Envir Mgt	10	9	9	
Arms Control	7	9	9	
Nuclear Waste Fund	3	4	4	
Total	388	409	400	

03/21/95

Full-Time Equivalents and Funding for Department of Energy Field Facilities

	---Full-Time Equivalents---			
Organization	FY 1994 Usage	FY 1995 Cong Req	FY 1996 Cong Req	Comments
Ohio Field Office				Includes Fernald Area Office, Miamisburg Area Office, West Valley Area Office
Stockpile Support	2	39		
Environmental Restoration	77	124	147	
Waste Mgt		52	61	
Facility Transition		30	37	
Total	79	245	245	
Oakland Operations Office				Includes Energy Technology Engineering Center Site
Nuclear Energy R&D	7	3	3	
Fusion Energy	3	2	2	
Uranium Enrichment Activities	2			
General Science Program Dir	5	7	7	
Weapons Prog Dir - Defense Program	89	88	88	
Environmental Restoration	19	40	43	
Waste Mgt	25	43	43	
Technology Development - Envir Mgt	4	4	4	
Oakland Operations Office	246	254	253	
Total	400	441	443	
Oak Ridge Operations Office				Includes Paducah Site Office, Portsmouth Site Office, Superconducting Super Collider Termination Project, Weldon Spring Site Office
Nuclear Energy R&D	15	15	15	
Uranium Enrichment Act	31	35	35	
General Science Prog Dir	8	8	8	
Superconducting Super Collider	34	49	19	
Stockpile Suppport	85	77		
Stockpile Mgt			77	
Environmental Restortion	73	117	122	
Waste Mgt	26	54	57	
Technology Development - Envir Mgt	6	10	10	
Oak Ridge Ops Office	414	408	404	
Nuclear Waste Fund	1	1	1	
Transportation	0	1	1	
Total	693	775	749	
Pittsburgh Energy Technology Center				
Technology Development - Envir Mgt		2	2	
Clean Coal Technology	34	33	26	
Direct Staffing	95	95	93	
Technical Program Direction	189	179	181	
Total	318	309	302	
Pittsburgh Naval Reactors	79	79	78	
Rocky Flats Area Office				
Stockpile Support	30	3		
Stockpile Mgt			3	
Environmental Restoration	11	40	40	
Waste Mgt	18	32	32	
Technology Development - Envir Mgt	5	3	3	
Facility Transition	157	224	227	
Total	221	302	305	
Richland Operations Office				
Nuclear Energy R&D	7	7	7	
Environmental Restoration	26	41	41	
Waste Mgt	142	219	220	
Technology Development - Envir Mgt	6	9	9	
Facility Transition	259	304	303	
Nuclear Waste Fund	1	1	1	
Total	441	581	581	
Southeastern Power Admin	42	41	41	
Schenectady Naval Reactors	68	70	69	
Strategic Petroleum Reserves	126	130	129	
Savannah River Operations Office				
Stockpile Support	10	10		
Stockpile Mgt			10	
Environmental Restoration	22	51	51	
Waste Mgt	78	173	176	
Technology Development - Envir Mgt	2	2	2	
Facility Transition			372	
Materials Support	431	387		
Total	543	623	611	
Southwestern Power Admin	198	196	195	
Western Area Power Admin				Includes Billings Area Office, Loveland Area Office, Phoenix Area Office, Sacramento Area Office, Salt Lake City Area Office
Operations & Maint	1,281	1,258	1,252	
Colorado River Basin	223	209	208	
Total	1,504	1,467	1,460	
Vienna Austria				
Arms Control	1	1	1	
Geneva, Switzerland				
Arms Control	1	1	1	

Full-Time Equivalents and Funding for Department of Energy Field Facilities

Organization	---Full-Time Equivalents--- FY 1994 Usage	FY 1995 Cong Req	FY 1996 Cong Req	Comments
Johnston Island				
Arms Control	1	1	1	
Paris, France				
Departmental Admin	1	1	1	
Tokyo, Japan				
Departmental Admin	1	1	1	
Moscow, Russia				
Departmental Admin	0	1	1	
Department of Energy Total	**19,838**	**20,549**	**20,839**	

STAFFING

Mr. Myers. Also for all offices other than DOE operations offices and power marketing headquarters offices, provide a brief description of the activities and programmatic functions of each office.

Secretary O'Leary. A table describing the activities and programmatic functions at all offices is provided for the record. (The information follows:)

PROGRAMS AND ACTIVITIES AT DOE FIELD SITES

Field Element	Programs Serviced	Description of Work Performed
Alaska Power Administration	Energy Efficiency	Operates, maintains and markets power from Alaska's two Federal Hydroelectric projects
Albuquerque Operations Office	Defense Programs	Serves as a contracting authority with laboratories and/or industrial contractors at Departmental facilities Conducts day-to-day interactions with contractors and represents program office in execution of assigned work
Amarillo Area Office	Defense Programs	Weapons production programs
Argonne Area Office	Energy Research	Management of Argonne National (Multi-program) Laboratory contract
Atlanta Support Office	Energy Efficiency	Weatherization grants for state and local governments and Native American tribes
Bartlesville Project Office	Fossil Energy	Management of research and development in enhanced oil recovery and advance extraction
Batavia Area Office	Energy Research	Management of FERMI National Laboratory contract
Billings Area Office	Energy Efficiency	Represents Western Area Power Administration for geographic areas under its jurisdiction
Bonneville Power Administration	Energy Efficiency	Construction of transition lines and marketing of power from Federal Hydroelectric projects in the Pacific Northwest
Boston Support Office	Energy Efficiency	Weatherization grants for state and local governments and Native American tribes
Brookhaven Area Office	Energy Research	Management of Brookhaven National (Multi-program) Laboratory contract
Carlsbad Area Office	Defense Program	Site manger over Waste Isolation Pilot Project for Defense Programs

Field Element	Programs Serviced	Description of Work Performed
Chicago Operations Office	Energy Research	Serves as a contracting authority with laboratories and/or industrial contractors at Departmental facilities Conducts day-to-day interactions with contractors and represents program office in execution of assigned work
Chicago Support Office	Energy Efficiency	Weatherization grants for state and local governments and Native American tribes
Dallas Support Office	Energy Efficiency	Weatherization grants for state and local governments and Native American tribes
Denver Support Office	Energy Efficiency	Weatherization grants for state and local governments and Native American tribes
Energy Technology Engineering Center Site Office	Fossil Energy	Management of Energy Technology Engineering Center Contract
Environmental Measurements Laboratory	Energy Research	Research and development in the field of environmental contamination from energy related sources
Fernald Area Office	Environmental Management	Environmental restoration of former weapons production facility
Geneva, Switzerland	Nonproliferation and National Security	U S Ambassador's Advisor for Energy to the Conference on Disarmament and expert on fissile material cutoff issues
Golden Field Office	Energy Efficiency	Management of National Renewable Energy Laboratory contract
Idaho Operations Office	Environmental Management	Serves as a contracting authority with laboratories and/or industrial contractors at Departmental facilities Conducts day-to-day interactions with contractors and represents program office in execution of assigned work
Kansas City Area Office	Defense Programs	Weapons production programs
Kansas City Support Office	Energy Efficiency	Weatherization grants for state and local governments and Native American tribes
Kirtland Area Office	Defense Programs	Management of Sandia National Laboratory (weapons) contract

Field Element	Programs Serviced	Description of Work Performed
Los Alamos Area Office	Defense Programs	Management of Los Alamos National Laboratory (weapons) contract
Loveland Area Office	Energy Efficiency	Represents Western Area Power Administration geographic areas under its jurisdiction
Metairie Site Office	Fossil Energy	Field implementation of environmental research and technology transfer programs for the oil and gas programs
Miamisburg Area office	Environmental Management	Environmental restoration of former weapons production facility
Morgantown Energy Technology Center	Fossil Energy	Research and development in fossil production , conversion and utilization
Moscow, Russia	Policy	Will assist the Department in overseeing the Newly Independent States initiation of the Industrial Partnering Program and the Nuclear Reactor Safety Program, and improve coordination with the Department of State and the U.S. Embassy in Moscow
Naval Petroleum Reserves CO,UT,WY	Fossil Energy	Management of petroleum and oil shale reserves to provide a source of liquid fuels for the arms forces during national emergencies
Naval Petroleum Reserves CA	Fossil Energy	Management of petroleum and oil shale reserves to provide a source of liquid fuels for the arms forces during national emergencies
Nevada Operations Office	Defense Programs	Serves as a contracting authority with laboratories and/or industrial contractors at Departmental facilities. Conducts day-to-day interactions with contractors and represents program office in execution of assigned work.
New Brunswick Laboratory	Nonproliferation and National Security	Nuclear materials standards and measurement laboratory to provide for safeguarding nuclear materials
New York Support Office	Energy Efficiency	Weatherization grants for state and local governments and Native American tribes

Field Element	Programs Serviced	Description of Work Performed
Office of Scientific & Technical Information	Science Education and Technical Information	Management of agreements for the dissemination of Departmental scientific and technical information products
Oak Ridge Operations Office	Defense Programs Energy Research Nuclear Energy	Serves as a contracting authority with laboratories and/or industrial contractors at Departmental facilities Conducts day-to-day interactions with contractors and represents program office in execution of assigned work
Oakland Operations Office	Defense Programs Energy Research	Serves as a contracting authority with laboratories and/or industrial contractors at Departmental facilities Conducts day-to-day interactions with contractors and represents program office in execution of assigned work.
Ohio Field Office	Environmental Management	Provides management of environmental restoration at former weapons program sites
Paducah Site Office	Nuclear Energy	Site management of gaseous diffusion plants contracts (Paducah, Kentucky)
Paris, France	Policy	Serves as the Science Advisor for Energy to the U S. Mission to the Organization for Economic Cooperation and Development in Paris. supports the Departments technology and science activities at the International Energy Agency and Nuclear Energy Agency, and supports the Nuclear Regulatory Commission's activities
Philadelphia Support Office	Energy Efficiency	Weatherization grants for state and local governments and Native American tribes
Phoenix Area Office	Energy Efficiency	Represents Western Area Power Administration geographic areas under its jurisdiction
Pinellas Area Office	Defense Programs	Weapons production programs
Pittsburgh Energy Technology Center	Fossil Energy	Research and development for coal and its derived synthetic fuels

Field Element	Programs Serviced	Description of Work Performed
Pittsburgh Naval Reactors Office	Nuclear Energy	Conduct research and development of naval nuclear propulsion plant and reactors
Portsmouth Site Office	Nuclear Energy	Site management of gaseous diffusion plants contracts (Portsmouth, Ohio)
Princeton Area Office	Energy Research	Management of Princeton Plasma Physics Laboratory contract
Richland Operations Office	Environmental Management	Serves as a contracting authority with laboratories and/or industrial contractors at Departmental facilities Conducts day-to-day interactions with contractors and represents program office in execution of assigned work
Rocky Flats Field Office	Environmental Management	Environmental restoration of former weapons production site
Sacramento Area Office	Energy Efficiency	Represents Western Area Power Administration geographic areas under its jurisdiction
Salt Lake City Area Office	Energy Efficiency	Represents Western Area Power Administration geographic areas under its jurisdiction
San Francisco Support Office	Energy Efficiency	Weatherization grants for state and local governments and Native American tribes
Savannah River Operations Office	Defense Programs Environmental Management	Serves as a contracting authority with laboratories and/or industrial contractors at Departmental facilities Conducts day-to-day interactions with contractors and represents program office in execution of assigned work
Schenectady Naval Reactors Office	Nuclear Energy	Conduct research and development of naval nuclear propulsion plant and reactors
Seattle Regional Support Office	Energy Efficiency	Weatherization grants for state and local governments and Native American tribes
Southeastern Power Administration	Energy Efficiency	Markets electric power generated at Federal Hydroelectric projects in 10 Southeastern states

Field Element	Programs Serviced	Description of Work Performed
Southwestern Power Administration	Energy Efficiency	Manages the transmission and marketing of electric power in designated Federal reservoir projects in the Southwest
Strategic Petroleum Reserve Office	Fossil Energy	Planning, development, and operation of crude oil and petroleum storage and distribution system
Superconducting Super Collider Termination Project Office	Energy Research	Management termination of contracts to develop and construct a Superconducting super Collider
Tokyo, Japan	Policy	Supports science and nuclear technology cooperation between the Department and the Government of Japan, facilitates communication between the Department and Japanese agencies and monitors the implementation of science and technology agreements
Vienna, Austria	Nonproliferation and National Security	Serves as the Science Officer at the U S Mission to International Organizations in Vienna concerning nuclear nonproliferation policy implementation Is responsible for policy issues to strengthen International Atomic Energy Association safeguards, technical assistance and cooperation, and coordination from Member States to the Former Soviet Union
Weldon Spring Site Office	Environmental Management	Environmental restoration of former weapons production facility
West Valley Area Office	Environmental Management	Environmental restoration of former weapons production facility
Western Area Power Administration	Energy Efficiency	Markets the power and energy generated at Federal generating projects in 15 Western states
Yucca Mountain Site Characterization Project Office	Civilian Radioactive Waste Management	To management contract for the development and construction for the long term storage of commercial nuclear waste

GENERAL

Mr. Myers. Why does the Department of Energy maintain posts in Tokyo and Moscow?

Secretary O'Leary. On-site representation in Tokyo supports the significant amount of science and nuclear technology cooperation between DOE and the Government of Japan. The DOE representative facilitates the communication between DOE and Japanese agencies. The office provides liaison services between the DOE science and technology program offices in monitoring and implementing science and technology agreements, and assists in efforts to promote the export of U.S. energy equipment and services.

DOE has experienced a rapid increase in its New Independent States (NIS) activities as a result of policy initiatives put forth by the Gore-Chernomyrdin Commission and the initiation of programs such as the NIS Industrial Partnering Program and the Nuclear Reactor Safety Program. Through these types of initiatives, the Department is playing a major role in achieving U.S. foreign policy objectives. To assist the Department of Energy in overseeing these activities and to improve coordination with the Department of State and the U.S. Embassy in Moscow, DOE is in the process of establishing an office in Moscow. The DOE office in Moscow will also provide valuable support for our non-proliferation and environmental restoration goals and objectives, as well as support for DOE federal and laboratory programs in other NIS countries.

Mr. Myers. Are there other international offices?

Secretary O'Leary. In addition to Tokyo and Moscow, the Department of Energy maintains offices in Paris, Vienna and Geneva.

The DOE representative in Paris is assigned to the U.S. Mission to the Organization for Economic Cooperation and Development, and is assigned to the Office of the Science Counselor as the Science Advisor for Energy. The DOE representative supports DOE's technology and science activities at the International Energy Agency, the Organization for Economic Cooperation and Development and the Nuclear Energy Agency. The DOE representative also supports the Nuclear Regulatory Commission's activities at the Nuclear Energy Agency. These organizations have a broad range of technology and science activities underway that are of keen interest to the Department as it implements the international dimension of the Administration's technology policy.

The DOE on-site staff person at the U.S. Mission to International Organizations in Vienna (UNVIE) supports DOE programs concerning nuclear nonproliferation policy implementation. In the capacity as Mission Science Officer, the DOE representative advises the Ambassador. The DOE representative is responsible for policy issues covering areas of strengthening IAEA safeguards, U.S. staff at the IAEA, IAEA technical assistance and cooperation, coordination of assistance from IAEA Member States to the Former Soviet Union, IAEA safeguards on excess special nuclear material under the U.S./IAEA Safeguards Agreement, assistance to the IAEA under the DOE/IAEA cooperation agreement, and country specific issues concerning safeguards in Iraq, North Korea, and the Former Soviet Union. The DOE representative in Vienna is paid for the by Office of Nonproliferation and National Security.

The DOE representative in Geneva is a permanent member of the U.S. delegation to the Conference on Disarmament (CD) and is assigned to the U.S. Ambassador as the Senior Advisor from the Department of Energy. The CD is in the process of negotiating the Comprehensive Test Ban Treaty (CTBT) and is expected to soon take up negotiation of a treaty to ban fissile material production for weapons. The DOE representative's assignment includes coordinating DOE's policy and technical input to the delegation in Geneva, serving as the Ambassador's expert on fissile material cutoff issues, and supervising the DOE office staff which currently consists of a contractor (laboratory) technical advisor and an office manager (local hire). The one DOE representative is on a 3-year, permanent change-of-station assignment. The DOE representative in Geneva is paid for by the Office of Nonproliferation and National Security.

LEGISLATIVE PRIORITIES

Mr. Myers. Please describe your top legislative priorities.

Secretary O'Leary. The following proposals will require legislation to implement:

- Privatization of the Naval Petroleum Reserves
- Sale of the Alaska Power Administration
- Privatization of the Southwestern Power Administration, Southeastern Power Administration, and Western Area Power Administration
- Sale of 7 million barrels of oil from the Weeks Island facility of the Strategic Petroleum Reserve
- Provision for the Civilian Radioactive Waste Management Program to use the net proceeds from the sale of the United States Enrichment Corporation as direct spending for the Program
- Clarification of authority for Federal agencies to contract with private power developers to share benefits of cogeneration retrofits.

HUMAN RADIATION EXPERIMENTATION

Mr. Myers. What is the status of the ongoing review of human radiation experiments and exposures?

Secretary O'Leary. In a little over a year since the President directed this effort, agencies of the Federal Government have reviewed millions of pages of documents dating back fifty years and handled over 15,000 requests for information on participation in human radiation experiments through the Interagency Helpline. The Department of Energy has released a Road Map to the story that provides an overview of the document search, institutional and topical historical narratives, records series descriptions of pertinent collections of documents nationwide, and descriptions of 150 human radiation experiments. A supplement to the experiment list will be completed in June 1995, describing 150-200 additional experiments.

Mr. Myers. How much has been spent by the Headquarters and field organizations in support of this effort?

Secretary O'Leary. To date, Headquarters has spent $7.3 million, and field organizations have spent $5.9 million.

Mr. Myers. What is the Department's total expected cost for this activity?

Secretary O'Leary. We project total cost for this activity to be $10 million for Headquarters and $9.1 million for field organizations.

Mr. Myers. There have been discussions of possible compensation to people who may have been harmed by past DOE radiation experiments. What is the status of this issue?

Secretary O'Leary. The Independent Presidential Advisory Committee on Human Radiation Experiments is considering the issue of whether a Federal response to subjects of human radiation experiments is appropriate. The Advisory Committee is expected to make its report to the Cabinet-level Interagency Working Group at the end of May 1995, including recommendations on potential Federal responses including compensation. The Administration will review the Committee's recommendations, and then determine whether a Federal response is appropriate. To date, a range of Federal responses has been examined, including an official apology by the government, health monitoring, research programs, and monetary compensation.

POWER MARKETING ADMINISTRATIONS

Mr. Myers: The President's budget request assumes the sale of Southeastern, Southwestern and Western Area Power Administration in the outyears. Please describe this legislative proposal

Secretary O'Leary: The President's proposal is to offer a preferential right to purchase these three PMAs to their existing firm power customers. The sales price would be based on the discounted net present value of the PMA's financial obligations to the Treasury at the time of the sale. The discount rate would be the Treasury's cost of borrowing money at the time of the sale.

The following table summarizes the preliminary estimates of the proceeds from the sale:

PMA Privatization
Analysis 1996-2000
(all $ in millions)

PMA	Date to Privatize	Estimated Sale Price	Net Revenues Lost	Net Revenues To Treasury
APA	end of FY 1996	$ 85	($ 27)	$ 58
SEPA	end of FY 1997	$ 909	($ 431)	$ 478
SWPA	end of FY 1998	$ 612	($ 136)	$ 476
WAPA	end of FY 1998	$ 2,863	($ 194)	$ 2,669
Total		$ 4,469	($ 788)	$ 3,681

The estimated sales prices for Southeastern, Southwestern, and Western Area Power Administrations are based on an earlier calculation of the net present value of the future repayment that Treasury would receive. The Alaska Power Administration has been included to be consistent with the budget document, but the sale price in that case is based on the previously negotiated sale price with the purchasers, consistent with the net present value concept.

The prices on the table are estimates that must be refined once more details concerning the privatization can be explored through a study. The "Net Revenues Lost" column represents the principal and interest payments to the Treasury in the five-year (1996-2000) budget scoring window, offset by the reduction in operating outlays.

The "Net Revenue to Treasury" represents the increase in revenue the Treasury would receive in the five-year (1996-2000) budget scoring window.

Mr. Myers: Has legislation been submitted for this proposal?

Secretary O'Leary: A legislative proposal has not yet been forwarded to the Congress. The Administration plans to submit legislation on PMA privatization in the near future so that a detailed privatization proposal can be developed in consultation with Congress and other interested parties. Upon completion of the study, and after further consultation with Congress and interested parties, specific legislation to implement the sale of each PMA will be submitted to the Congress.

Mr. Myers: Which authorizing committees would need to act on this proposal?

Secretary O'Leary: It is our understanding that the authorizing committees for the PMAs are the Senate Energy and Natural Resources Committee and the House Resources Committee. Whether there would be referral to any other committees would depend on the content of the legislation.

Mr. Myers: Privatizing the power marketing administrations will create strong opposition in many areas of the country. Knowing this will be a difficult process, what steps can you take to overcome this opposition?

Secretary O'Leary: Opposition to the sale of the PMAs stems primarily from concerns that there will be significant rate increases to existing PMA power customers. The Administration has taken three steps to address the concerns of those who might otherwise be opposed to the Administration's privatization proposal. The first step taken was to base the selling price for the PMAs at the discounted net present value of the PMA's financial obligations to the Treasury at the time of sale. This, along with expected operating efficiencies, will minimize or even eliminate any rate impacts. The second step is the Administration's commitment to giving a preferential right of purchase to the existing firm power customers. The third step is our commitment to develop a specific proposal for each PMA sale after careful consultation with Congress and other interested parties.

GALVIN REPORT

Mr. Myers. Please describe your reaction to the Galvin report on "Alternative Futures of the Department of Energy National Laboratories."

Secretary O'Leary. The Department established the Task Force on Alternative Futures of the Department of Energy National Laboratories because we identified the need for independent, expert guidance about the future of the Department's ten largest laboratories. We wanted this study to be done and are enthusiastic about its contents. More importantly, the Department is committed to using the report as an instrument to help the laboratories reach new levels of performance and productivity in addressing vital national needs.

Mr. Myers. Which recommendations will you be implementing and which do you not expect to implement?

Secretary O'Leary. The Department intends to implement 24 of the 29 recommendations listed in the Summary of Recommendations chapter of the Galvin Report. The specific commitments and deadlines for each of 24 recommendations that we will act on, as well as a description of our position on the remaining 5 recommendations, were contained in a March 8, 1995, report from the Department to the National Science and Technology Council (NSTC). A copy of our report to the NSTC will be forwarded to the Subcommittee. This report also provides a detailed description of actions which the Department is committing to in response to issues raised in Appendix B of the Galvin Task Force report. In aggregate, these commitments demonstrate the seriousness with which we are addressing issues raised by the Galvin Task Force.

Mr. Myers. The Department's fiscal year 1996 budget request includes program savings of $50 million in the Energy Supply, Research and Development Activities account due to recommendations of the Galvin report. Please identify the specific actions which will be taken and the amount of savings resulting from each.

Secretary O'Leary. The $50 million identified in the Department's FY 1996 budget was established well before the Galvin Task Force had completed its work. This estimate was based on the presumption that the Galvin Task Force would find ways to save costs at the Laboratories but made no assumption on the type of savings. The Galvin Task Force has since completed its report, which was released to the public on February 1, 1995. The Task Force has made a number of general recommendations that could save costs at the Laboratories, but they also made recommendations that would increase program expenses. The Department has developed a detailed response to each of the Task Force's 29 recommendations, and has also developed a Management Improvement Roadmap aimed at removing costs from the laboratory system. Specifically, the Management Improvement Roadmap will simplify audits and appraisals, reduce the burden of the Department's directives system, reform the procurement system for the contractors that manage the Department's laboratories, and begin the shift toward external regulation. The specific savings that will emerge from these actions have not yet been identified. We are confident that they will meet the $50 million figure established for the FY 1996 budget.

Mr. Myers. Why were no savings projected for the defense programs laboratories?

Secretary O'Leary. As stated above, the $50 million figure was an estimate that was established before the Galvin Task Force report was finalized. The allocation of specific savings within this figure has not been made. However, to the extent that savings will be found within the defense program laboratories, they will be so reported. Furthermore, it was not the Department's intent to limit such savings to the Energy Supply R&D account. The budget narrative states that "...the Administration recommendations will be distributed across several different accounts within the Department". The President's proposed appropriations language also makes this point explicitly:

> "...The amount appropriated herein reflects anticipated savings of $50,000,000 associated with implementing the recommendations of the Task Force on Alternative Futures for the Department of Energy National Laboratories: Provided further, that in the event some portion of savings may be transferred to this account without regard to the requirements or limitations of section 302 of Public Law 102-377..."

Finally, we wish to call the Committee's attention to an error in the President's budget narrative that resulted from the unintentional inclusion of a previous version of the budget text. Specifically, at the beginning of the Energy Supply R&D account, the budget narrative states that "For the purposes of presenting this reduction in the President's budget request, all program activities in the Energy Supply R&D account have been uniformly reduced by 1.4 percent".

In fact, such reductions to program activities are not reflected in the President's proposed line item budget levels in that account. Rather, the $50 million in savings is included as part of the $109.5 million bottom-line reduction to the Energy Supply R&D account, entitled: "Reinventing government proposal".

ENVIRONMENTAL CLEANUP

Mr. Myers. How would you characterize the status of the Department's environmental management program at this time?

Secretary O'Leary. The program has matured to an operational level far above what was possible during its first five formative years. For example, we are now devoting more resources to on-the-ground cleanup than study and characterization processes. The budget request for FY 1996 reflects the first real reduction in the base funding since inception in 1989. Managerial changes have helped make the program more efficient (with savings of $2 billion from FY 1994 through FY 1996), more productive, and more efficient. The priorities for the program are clearly set by addressing the most urgent risks first.

We are also contributing significantly to the President's program to reduce spending and the deficit, and have planned $4.4 billion in budget cuts over the next few fiscal years (1997 to 2000). However, there are limits to how large and how fast budget reductions can occur without jeopardizing our ability to meet our obligations to protecting human health and safety. I believe these reductions are achievable and necessary, but there are dangers in cutting too much too fast. The Environmental Management program has obligations to protect human health and safety from some of the nation's most urgent environmental risks. There is much to do, and we will continue to make significant progress in addressing our responsibilities provided we are given adequate resources.

Mr. Myers. What do you see as the most significant successes and what concerns you most about the program?

Secretary O'Leary. In the last year, we have successfully reduced some of the most urgent risks in our program. For example, we are now operating -- on a routine basis -- a mixing pump that virtually eliminates the risk of an explosion in a high-level radioactive waste tank at Hanford. We also began the stabilization of fire-prone plutonium inventories at Rocky Flats, and plan to complete this project this year. We have substantially improved the safety of our stored spent nuclear fuel as a result of transferring 199 elements to improved and upgraded facilities.

The Department has also made substantial progress in addressing many less urgent, but nonetheless significant, long-term risks. For example, last year we completed 132 interim actions and 32 larger scale cleanups, as well as other actions such as shipping hazardous waste capsules from a Colorado facility located in a residential area to Hanford, Washington.

We are improving our managerial and financial control of the program through initiatives such as contract reform.. We are renegotiating and recompeting $30 billion worth of contracts. One of the first results of these efforts was the consolidation of our contracts at the Idaho National Engineering Laboratory. This will save over $500 million over the next five years. A similar type of contract will soon be awarded at the Rocky Flats Plant.

What concerns me about the program is our ability to continue to adequately protect the public from these risks in the face of budget reductions that go too deep. Our plans for budget reductions and efficiency gains are ambitious, even when compared to what the nation's best private sector corporations can accomplish. Therefore, additional reductions in our resources have the potential to seriously undermine our capability to carry out our responsibilities. Let me emphasize that this goes beyond compliance with our legal commitments. Beyond falling short of meeting all of our legal obligations, it worries me that our efforts to stabilize and safeguard nuclear materials and contaminated buildings will be compromised. This could result in a serious human health, safety or environmental incident.

Mr. Myers. The technology program for development of new environmental cleanup technologies is not adequate, and more basic research is needed to develop long-term technologies which do not exist today. The Galvin report suggests a lack of leadership by the Department and poor management of the science/engineering and operational interface. Since DOE has direct access to some of the best basic research capabilities in the world, what are you doing to establish a linkage between the environmental managemental program and the energy research program.

Secretary O'Leary. The Department has restructured the technology development activity into five technology focus teams established around major DOE problem areas. They include (1) mixed waste, (2) radioactive waste tanks, (3) contaminant plumes, (4) hazardous landfills and (5) facility decommissioning. Each integrated focus team includes the technology users, researchers and technology developers, regulators, and stakeholders. Using a life cycle system approach, these teams determine technology needs, jointly develop innovative technologies and assure implementation and use. Each team is working with other DOE Offices, such as Energy Research, and other federal agencies to assure coordination from the basic research phase to the applied research phase, the demonstration phase, and the implementation phase. We anticipate that this restructuring will eliminate duplicative work and smoothly accelerate the implementation of cost effective environmental technologies from basic research through implementation.

There are a number of examples where this coordination with the energy research program has already occurred. For example in the area of efficient separations we are coordinating with Energy Research in the development of an Advanced Integrated Solvent Extraction System, Alkaline-Side Technetium and Actinide Solvent Extraction Using Crown Ethers and Other Extractants, and Derivatives of Natural Complexing Agents for Removing Plutonium from Waste Streams. In the area of characterization, we are coordinating with Energy Research in the development of Secondary Ion Mass Spectroscopy.

ENERGY TECHNOLOGIES

Mr. Myers. This Committee will be reviewing all applied and basic research performed by the Department and proposed in the fiscal year 1996 budget. What criteria would you recommend that the Committee use in evaluating the effectiveness of the various energy research and development programs currently funded by the Department?

Secretary O'Leary. It has always been difficult to evaluate the effectiveness of basic and applied research by quantitative indicators, especially from the standpoint of social returns. Economic results, such as numbers of jobs created or value added, are hard to trace back with any precision to their origins in research. There are just too many other factors involved in bringing the results of research to the marketplace, like the cost of money, production, manufacturing, and marketing, to name a few.

This does not suggest that there are not ways to judge research effectiveness, for it is routinely done using time-tested indicators. The extent to which the research results of a particular project affect other research in the field is an important indicator. Scientists often look at the degree to which programs stimulate related work or alter established understanding. The productivity of programs measured in terms of the number of high-quality publications and scientific presentations is another.

The Department generally uses four such high-level indicators to measure the effectiveness of its ongoing basic and applied research. They are:

1. Quality Of The Science, as indicated by expert advisory committees; peer reviews of the research; sustained progress; recognition by the scientific community; and world-class research facilities.

2. Relevance To DOE Missions And National Needs, as indicated by sustained advancement of fundamental science; program support of energy and other civilian technology development programs; joint efforts with industry or other government agencies; and availability of advanced research facilities that serve the needs of a wide diversity of scientific users from industry, academia, and government laboratories. When considering the initiation of new strategic R&D or the renewal of such ongoing research, the following additional criteria must also be applied: R&D goals; funding levels; program successes potential benefits (economic, environmental, energy security, national security, and social equity); risk factors (technical risk, environmental/social risks, and economic/market risks); and the need for Federal participation.

3. Effectiveness and Efficiency of Research Program Management, as indicated by well developed research plans; meeting budget projections and milestones; identifying and overcoming technical problems; and effective decision-making in managing and redirecting projects.

4. Management and Utilization of Research Facilities That Meet User Needs and Requirements, as indicated by achieving performance specifications; meeting schedule and cost milestones; operating facilities that are used for research at the forefront of science; operating reliably according to planned schedules; maintaining and improving facilities at reasonable and defensible cost; and obtaining endorsement by strong and enthusiastic user organizations.

Mr. Myers. Please describe the status of the domestic fusion energy program.

Secretary O'Leary. Fusion Energy offers the potential of an environmentally acceptable, economically competitive energy source with a virtually unlimited and widely available fuel source. To accomplish this objective, the DOE has structured an integrated science program centered around the International Thermonuclear Experimental Reactor (ITER) project whose purpose is to demonstrate the scientific and technological feasibility of fusion. There are three basic elements to this program, the ITER Engineering Design Activity (EDA), the Tokamak Physics Experiment (TPX) and the base program. The ITER EDA began in July 1992, and will be completed in July 1998. It will provide the design and the associated R&D to the four Parties to use as part of an international collaborative program to construct ITER or to use in their own domestic programs. The purpose of the TPX is to develop the scientific basis for a continuously operating, cost competitive demonstration power plant by making the tokamak smaller, more efficient and less expensive to build and operate. The base program consisting of medium sized tokamaks, supporting smaller scale experiments, a theory program and a limited technology development program is exemplified by the recent successful experimental results on the Tokamak Fusion Test Reactor which produced over 10 million watts of fusion power. In addition to these exciting experimental results in the base program, excellent progress has been made on both ITER and TPX. On ITER, the 6-year EDA is nearing its midpoint and almost 75 percent of the design plus research and development tasks have been identified and assigned to the four ITER Parties for completion in 1995 and beyond. The national TPX design team is completing the process of bringing industrial participants on board to carry out the engineering design. The conceptual design and the appropriate business systems have undergone successful reviews by teams of experts from the DOE. Recent short pulse experiments and theoretical results from the base program have confirmed that TPX should operate as predicted.

The fusion program is focused on the goal of having a demonstration power plant operating in about 2025, and on meeting the Energy Policy Act of 1992 requirement to conduct a technology demonstration of the practicability of commercial electric power production by 2010. Recognizing the funding increase that would be required to accomplish this, the Congress has asked the President's Committee of Advisors on Science and Technology to review the fusion program. We currently anticipate that this review will be completed this summer.

Mr. Myers. Is the International Thermonuclear Experimental Reactor (ITER) still the centerpiece of the United States program?

Secretary O'Leary. Yes, ITER is the centerpiece of the U.S. fusion program.

Mr. Myers. If ITER does not go forward, what happens to the U.S. fusion program?

Secretary O'Leary. The purpose of the International Thermonuclear Experimental Reactor (ITER) is to demonstrate the scientific and technological feasibility of fusion. ITER would be the first fusion device ever to achieve the sustained burn of a deuterium-tritium plasma and to provide an integrated test bed for the technologies needed to build and operate a demonstration electrical power plant. If ITER does not go forward, we would lose the ability to reach our objective of producing fusion power in the 21st century. The impressive technical progress of the fusion program has shown its potential as an energy source for the future. A similar device to ITER could be done unilaterally by the U.S., but at significantly increased cost.

The President's Committee of Advisors on Science and Technology has been charged to review various options for structuring the Department's magnetic fusion energy program. In this review, they will consider an appropriate structure for the program if the U.S. should elect not to participate in the construction of ITER. Their report is expected in June of this year, and will strongly influence the Department's planning for the future of the program.

ENERGY TECHNOLOGIES

Mr. Myers. Funding for solar and renewable energy continues to increase in the budget request. Excluding hydropower, how much energy will be supplied to the grid through solar and renewable technologies between 1995 and 2000, and what is the cost of that energy?

Secretary O'Leary. According to the Annual Energy Outlook 1995, published by the Energy Information Administration, installed non-hydro renewable capacity will grow from the 1993 level of 15,000 MW to 18,400 MW in 2000. The electricity generated by this capacity will increase from 80 billion kilowatt-hours/year to 96 billion kilowatt-hours/year, or between $6 billion and $8 billion in annual revenues at the US average retail electricity price of 8 cents/kilowatt-hour. These EIA projections do not reflect deployment activities recently incorporated into the renewable programs -- activities that the Department believes will add significantly to the EIA figures and result in several billion dollars in increased revenue.

Over this period, renewable program managers believe that energy costs from new wind facilities should improve from 6-8 cents/kWh to 4 cents/kWh, from geothermal brine sources, 6-7 cents/kWh to 4 cents/kWh, from dedicated biomass, 8-10 cents/kWh to 5-6 cents/kWh, and from photovoltaics, 25 cents/kWh to 12 cents/kWh. This cost diversity is roughly parallel to current cost variations in conventional generation wherein baseload plants are frequently in the 2-4 cents/kWh range and peaking plants may be 8 cents/kWh or more and, in a few cases, as high as 12 cents/kWh.

Mr. Myers. What do you see as the potential impact of the solar programs on our energy needs in the near, mid, and long term?

Secretary O'Leary. In the near term, we believe that our programs will lead to a US installed non-hydro renewable capacity significantly greater than the EIA projection of 18,400 MW, with the accompanying revenues and energy generation costs just described. By 2010, installed capacity could be as much as 90,000 MW and, by 2025, several times that figure. Significantly, by 2020 or 2025, 50% or more of the new capacity added could be renewable based -- in other words, these technologies could become a mainstay for electricity production. But this is only half of the picture. Technological leadership and domestic commercial success leads to global success. Today, exports represent a significant share of US geothermal and PV business activity. There is every reason to believe that the substantial domestic growth forecast for renewable systems will be reflected in export growth rates for all renewable technologies, shifting the US energy balance of trade from heavily negative to positive.

ADVANCED REACTOR R&D

Mr. Myers. The budget request for nuclear energy activities is $382,000,000 but only $49,000,000 is for actual energy research and development, and that is limited to the advanced light water reactor design. Do you see any role for other advanced reactor technologies in this country's energy future?

Secretary O'Leary. The Department of Energy's emphasis in nuclear reactor technology has changed significantly over the past several years. Efforts on longer term technologies have been phased out and the focus has shifted to support efforts that can have a nearer term impact on the commercial energy sector. The advanced liquid metal cooled breeder reactor activities have been phased out and the associated facilities are being shutdown. The Department has also recommended work on the high temperature Gas Cooled Reactor program be terminated.

These technologies may have potential in the long term but budget priorities require that the Department focus its limited resources in those areas that can help maintain the nuclear option in the near term. Therefore, the focus is on advanced light water reactor technology which is the only technology that the electric utilities are likely to build in the next several decades.

The overall objective of our ALWR program is to assure that safe, economical reactor designs are available in the marketplace as options for selection by private-sector companies planning to expand their electricity generation capacity. The program will achieve Nuclear Regulatory Commission certification of four standardized ALWR designs and completion of non-site-specific detailed design work for two of these designs. These designs will be available to potential domestic and foreign customers before the end of the decade.

Nuclear energy plays a vital role in our current energy picture and the Department's program will help provide the potential for advanced light water reactors to contribute to the nation's energy mix by early in the next century.

ENERGY TECHNOLOGIES

Mr. Myers. Does your analysis of future energy demand and availability indicate that needs can be met by renewables, natural gas and energy conservation only?

Secretary O'Leary. No. The Energy Information Administration's Annual Energy Outlook 1995, published in January 1995, indicates that total energy consumption in 2010 will be 103.9 quadrillion Btu (quads) in the reference case forecast. Of that amount, natural gas will provide 21 percent, and renewables 9 percent. Domestic crude oil and lease condensate will provide 11 percent, natural gas plant liquids 3 percent, coal 24 percent, and nuclear power 6 percent. The remainder will come from imports of crude oil, petroleum products, natural gas, and electricity, and small amounts of supplemental natural gas, methanol, and liquid hydrogen. While energy conservation in the form of improved efficiency and technological improvement will substantially reduce total consumption from what it otherwise would have been, we have not quantified that impact.

NUCLEAR WASTE FUND

Mr. Myers. Your budget request for the Civilian Nuclear Waste Fund assumes enactment of legislation allowing the use of revenues from the Nuclear Waste Fund account in Treasury. Please describe the proposed legislation.

Secretary O'Leary. The civilian portion of the Radioactive Waste Management Program currently is funded by the beneficiaries of the program through collection of a fee on the commercial generation of nuclear power. Annual appropriations to the program from the Nuclear Waste Fund, however, are considered to be discretionary appropriations subject to the discretionary spending caps established by law even though the rate payer contributions finance the programs. Hence, the program must compete against other programs for a share of the Department's allocation within the Federal Government's discretionary appropriations cap. Under the Department's funding proposal, specific amounts would be made available to the program outside the discretionary spending caps in fiscal years 1996-1998. Assuming the asset sale waiver to Section 257(e) of the Balanced Budget and Emergency Deficit Control Act of 1985 in this bill is enacted, this spending would be offset for budgetary scorekeeping purposes by additional Treasury receipts associated with the sale of the United States Enrichment Corporation. This amount is estimated to be approximately $1.6 billion. The proposal also includes a provision that allows the Appropriations Committee to provide limitations and/or direction to the funding of the program. That oversight would be similar to the relationship that this Committee has had with the Bonneville Power Administration and this addresses a principal concern with the funding proposal submitted last year.

Mr. Myers. Which authorizing committees in the House and Senate will need to act on this request?

Secretary O'Leary. The House Committee on Commerce (Subcommittee on Energy and Power), and the Senate Energy and Natural Resources Committee are the authorizing committees which will need to act on the proposed legislation.

Mr. Myers. Please outline your strategy for getting this legislation enacted by the beginning of fiscal year 1996.

Secretary O'Leary. The legislative proposal was submitted to Congress on February 27, 1995. The Department expects Congress to consider this legislation early in this session of Congress. Regarding the use of proceeds from the sale of the U.S. Enrichment Corporation to fund the civilian nuclear waste program, the Administration's goal is to privatize the United States Enrichment Corporation in fiscal year 1996. The Energy Policy Act of 1992 requires the Corporation to submit a plan and report on privatization to the President and the Congress prior to July 1, 1995. These dates are consistent with Congressional intent to complete the privatization process in an expeditious fashion.

Mr. Myers. If this strategy appears to be failing, will the administration submit a budget amendment to request full appropriations for the Nuclear Waste Fund?

Secretary O'Leary. If, for some reason, privatization of the United States Enrichment Corporation is delayed for a few months, the Department recognizes that the Civilian Radioactive Waste Management Program, under this proposal, would temporarily lack sufficient budgetary resources, particularly at the beginning of fiscal year 1996. Consequently, the Administration plans to review the adequacy of its budget request prior to July 1, 1995, or prior to the time of Congressional appropriation action, whichever occurs earlier. The Administration is prepared to submit a deficit-neutral amendment or supplemental budget request to address any temporary budgetary shortfalls in the program.

EXCESSIVE OVERSIGHT

Mr. Myers. Madam Secretary, several witnesses this year have complained about the excessive oversight of the DOE facilities from internal and external oversight groups. One of the consistent recommendations has been to permit DOE facilities to comply with the same regulations that apply to commercial and university facilities which are externally regulated by EPA, NRC and OSHA. The overlay of separate and more stringent DOE guidelines appears to be strangling your programs. Could you respond to this concern?

Secretary O'Leary. We agree that this issue should be examined. Accordingly, we established the Advisory Committee on External Regulation of Department of Energy Nuclear Safety. The purpose of the Advisory Committee is to recommend regulatory reforms to assure existing and new Department facilities are most effectively and efficiently regulated with regard to nuclear safety. The safety functions considered will include facility safety, worker protection, emergency response, and protection of the public and the environment from radiological hazards. The first meeting was held March 9 and 10 in Washington, DC at Department of Energy Headquarters. It was open to the public and there were opportunities for public comment. The Committee is co-chaired by John F. Ahearne, Executive Director of Sigma Xi and former Chairman of the Nuclear Regulatory Commission, and Gerard F. Scannell, President of the National Safety Council. The Committee consists of 24 members drawn from the Federal, State, and private sectors. Membership is focused on persons with environment, safety and health backgrounds as well as those with nuclear safety expertise, balanced to represent different nuclear, radiation and environmental protection, and regulatory experience. I have asked the Advisory Committee for their recommendations and a final report this year.

Mr. Myers. There appears to be a major disconnect in the way the Department has structured the implementation of environment, safety and health guidelines. The people who are issuing the orders do not have to be concerned with the cost of implementation which is borne by the line programs or buried in overhead accounts. In effect, you have one organization in DOE issuing "unfunded mandates" to other organizations with little concern for cost impacts on line programs. How can this be resolved?

Secretary O'Leary. Environment, safety and health is a fundamental part of doing business. Successful organizations recognize this fact and recognize that good safety, health and environmental protection programs are a key to a successful "bottom line." At the same time, we know that more can be done to make our environment, safety and health programs more efficient and less burdensome. Important steps we are taking include implementing a streamlined standards-based, performance oriented system for all Department of Energy facilities, reducing the number of environment, safety and health orders by clarifying the necessary requirements and eliminating overlapping and outdated requirements, and streamlining oversight at all levels to reduce the burden imposed by multiple layers of oversight reviews.

TECHNOLOGY PARTNERSHIPS

Mr. Myers. The Department uses the number of Cooperative Research and Development Agreements that have been signed as a measure of success of the laboratory technology transfer program. A better measure would be the benefits derived by the laboratories and industry from these arrangements which are supposed to provide some type of dual benefit. Can you quantify the benefits to the laboratories and the success of these agreements?

Secretary O'Leary. We will be able to measure and evaluate the benefits of these ageements as they come to fruition. Keep in mind that our Cooperative Research and Development Agreements (CRADAs) are quite new. Over 90 percent of our CRADAs, which are typically three year partnerships, have been started in the last three years. As a result, only ten percent have been completed, mostly in the last year. During the early years of the program, we could measure the number of agreements, resources committed, processing time, and customer satisfaction. We are now putting in place a system to measure the benefits. This data will be collected systematically throughout the Department through an on-line system, the Integrated Technology Transfer System, which we expect to be a model for other agencies.

Although we will have precise information about the technical results of our partnerships, one should not expect overly precise information on the economic benefits. Measuring the results of research and development is inherently complex and difficult. There is usually a significant time lag between when research is completed and when economic benefits accrue, and the path from a single technical innovation to jobs and economic growth is not straightforward. Although these problems have challenged economists for decades, there is agreement that well designed and managed R&D programs provide a very high return on investment.

We expect a high return on our investment by leveraging our R&D funds with those of industry. Our CRADAs to date include partner contributions of over $1.2 billion, 58 percent of the total CRADA value. The Government receives fully paid-up, worldwide residual use licenses to all intellectual property developed by partners under CRADAs. One of the criteria for CRADA selection and funding is anticipated DOE program benefit. A few examples illustrate the kind of dual benefits that we expect:

- The Pacific Northwest Laboratory is improving its near-field optical microscope via a CRADA with a small business. This will greatly increases the precision available to scientists seeking to understand complex chemical and biological systems. The microscope itself will be used at PNL's Environmental Molecular Sciences Laboratory.

- Los Alamos National Laboratory, in a CRADA with Schlumberger Doll Research, is developing new algorithms and a graphical user interface that will improve its ability to do radiation transport calculations. Such calculations play a crucial role in DOE work ranging from nuclear weapons stewardship to radiation health physics. Specific benefits include improved computational physics, better visualization, greater efficiency and a more user-friendly interface in all applications that apply Los Alamos radiation transport codes.
- The Kansas City Plant increased its knowledge of filled plastic material behavior and processing parameters via a CRADA with ECOMAT, Inc. This knowledge has applications in both weapons and the construction industry.

Mr. Myers. There is concern that many companies are entering into Cooperative Research and Development Agreements with DOE for activities they would have performed anyway and fully funded. How can you assure that these agreements are not just subsidizing research work which would have been performed by the company?

Secretary O'Leary. Companies enter into CRADAs to accomplish their goals more efficiently and effectively than they can on their own. Laboratories enter into CRADAs for the same reasons. In most cases companies use CRADAs to do work that they can not support by themselves. Companies generally prefer to go it alone if they can, because they then obtain all the intellectual property rights and do not have to spend time negotiating and managing a partnership. Companies tend to choose partnerships when the company lacks the resources, the expertise, or the equipment for a project.

There is no way to assure that companies would not perform the same work on their own in the absence of a CRADA. However, that should not be the issue. If the Department enters into a partnership that supports its missions (i.e. by sharing the cost or knowledge to develop needed technologies) and the partner also saves money or time that it would have spent anyway, it is clearly a desirable parntership that benefits both the Department and the economy. The same situation exists when two private companies choose to cooperate in R&D -- they may or may not have been able to do the work on their own, but it is more efficient for them to do the work in a partnership. Neither partner subsidizes the other, but both sides benefit.

These kinds of partnerships are increasingly important and common as technology becomes more complex and fast moving. No company or laboratory can afford to be on the cutting edge of all the areas of technology that are needed for its business or missions, and partnerships are a effective way to reduce the cost of exploring and developing new technologies.

INTEGRAL FAST REACTOR PROGRAM REDIRECTION

Mr. Myers. Last year Congress unfortunately went along with the Administration's recommendation to terminate the Integral Fast Reactor (IFR) program. This subcommittee also approved your request to reprogram monies for Argonne's redirection activities, which are to be reviewed by the National Academy of Sciences. What is the status of those reviews?

Secretary O'Leary. In response to a request from the Department of Energy (DOE), the National Academy of Sciences formed a committee to conduct a study of electrometallurgical techniques as potential technologies for the treatment of DOE spent fuel. The application of such technology to DOE spent fuel is one of the Argonne National Laboratory redirected activities and is the only redirected activity that required a review by the Academy.

In February 1995, the Academy issued a preliminary assessment stating that

> "based on the technical presentations to the committee, discussions with the presenters, written materials reviewed by the committee, and the experience base of the committee members, the committee did not identify any "showstoppers" in the technical proposal that would suggest discontinuing the planned R&D. The committee concluded that electrometallurgical techniques represent a sufficiently promising technology for treating a variety of DOE spent fuels to warrant continued R&D in Federal FY96."

The Committee will complete its deliberations and issue a final report in May of 1995.

Mr. Myers. If the NAS report indicates that the redirected programs should continue, is there sufficient funding in your budget request to provide for this activity?

Secretary O'Leary. Yes. The FY 1996 budget request for Nuclear Technology Research and Development will provide adequate funds to allow the Department to respond to either a positive or a negative finding from the NAS. While the request will provide for the proposed nuclear R&D program at Argonne National Laboratory, were the Acadamy to determine that these activities should not continue, these same funds would be sufficient to manage the resulting program termination.

PROJECT SAPPHIRE

Mr. Myers. This fall's successful Project Sapphire brought highly enriched uranium from Kazakhstan to Oak Ridge for storage. At the time, other nations such as Iran were interested in purchasing the material. It has been reported that the United States paid $30 million for 600 kilograms of the uranium. That amount seems a bit high. Could you comment on the circumstances of the exchange?

Secretary O'Leary. At the direction of the President, operation Sapphire was undertaken to relocate weapons-useable highly-enriched uranium (HEU) from Kazakhstan to the United States. In all, 581 kilograms of highly enriched uranium from the Ulba Metallurgical Plant was repackaged to meet international shipping and storage requirements and then transported to the Department's Y-12 plant at Oak Ridge, Tennessee. Measurements were made on the material during repackaging to assure that only material that posed a proliferation threat, i.e., materials containing HEU, would be brought to Y-12. The HEU existed in several chemical forms (metal, alloys with beryllium and oxides) and some of it required processing to meet international shipping requirements.

This operation developed from an agreement between the United States and Kazakhstan for the United States to purchase and remove the HEU from Kazakhstan. The U.S. goal was to prevent this material, for which Kazakhstan has no use, from falling into the hands of terrorists or rogue governments, thus decreasing the world-wide risk of proliferation.

The repackaging operation in Kazakhstan was preceded by two other missions by Y-12 personnel to the Ulba plant: First, a one person reconnaissance mission in March 1994, and second, a 10-person site survey team in July.

Samples returned to Y-12 from the March reconnaissance confirmed HEU and provided an estimate of the substantial size of the cache; i.e., enough HEU for approximately two dozen nuclear weapons.

The site survey team confirmed that the repackaging operation could be done safely and developed, with the Ulba Plant director, a joint statement outlining each side's responsibilities for conduct of the operation.

The operation itself was complex and arduous. For six weeks, October 9 to November 20, 1994, a 27-person team of DOE contractor experts from Y-12 repackaged and performed quality control measurements on the HEU at the Ulba Plant to ensure that it met strict international shipping regulations and Y-12 storage requirements. U.S. Sapphire Team members and Kazakhstani technicians worked together to process these materials, as required, to meet international shipping and storage specifications.

Two U.S. Air Force C-5A transport aircraft returned the Sapphire Team and repackaged HEU to Dover AFB, Delaware, on November 20 and 21, 1994. The HEU was detained by U.S. Customs at Dover and turned over to DOE for safe storage. It was transported by the Department's Safe Secure Transports to Y-12 for interim storage pending final disposition. The HEU arrived at Y-12 on November 22 and 23, 1994.

Storage at Y-12 is considered to be an interim measure since we are committed to converting it to a non-weapons-useable form as soon as possible.

Mr. Myers. Is the payment to be directly in cash or in-kind contributions as well?

Secretary O'Leary. Compensation for the HEU transferred to the U.S. under Project Sapphire included cash plus a package of in-kind assistance. The amount of Sapphire compensation package is classified, and by interagency agreement, will remain classified, to avoid creating a possible benchmark price for such transactions.

Mr. Myers. In the future, what indicators will be used by the Department and the Administration in negotiating with foreign nations on the purchase of uranium?

Secretary O'Leary. Following Sapphire, the National Security Council directed the interagency "Tiger Team" that implemented Sapphire to prepare a report on lessons learned from Sapphire and provide policy guidance on how to evaluate and handle any future Sapphire-like situations -- i.e., caches of weapons grade fissile materials that might be offered to the United States to remove the material as a proliferation threat. That report is not yet completed.

Mr. Myers. What funds were used to purchase the material?

Secretary O'Leary. As discussed previously, specific details of the funding for Sapphire remain classified since such details might be used to determine the amount of the Sapphire compensation package.

Mr. Myers. Is there any request in your 1996 budget for similar activities?

Secretary O'Leary. The overview of the Department of Energy verification and control technology budget states that a priority in the FY 1996 budget is limiting weapon-usable fissile material by, among other actions, "ensuring that the United States is prepared to accept foreign origin weapons useable materials to reduce the danger of proliferation when the President deems this action necessary." The Department's request includes $15 million for International Security Commitments which could be used to implement this activity should it be necessary.

Mr. Myers. Your agency initiated a late September shipment of spent foreign fuel rods into Savannah River. South Carolina filed a lawsuit to block the shipments, but the issue was resolved with the shipments proceeding to the SRS facility. What is your timetable for future foreign spent fuel shipments?

Secretary O'Leary. The lawsuit regarding urgent-relief acceptance of foreign research reactor fuel containing US-origin enriched uranium is still pending in South Carolina. Until there is a resolution, the Department has not made any plans or established any timetables for future shipments of urgent-relief foreign spent fuel.

Mr. Myers. Is SRS to become a permanent repository for foreign spent fuel?

Secretary O'Leary. The Department of Energy has no intention for foreign research reactor spent nuclear fuel shipped to the Savannah River Site to be permanently stored there. The spent fuel will ultimately be disposed of in a geologic repository, as authorized by the Nuclear Waste Policy Act, as amended. The urgent relief spent fuel was shipped to SRS because the site had existing facilities for safely storing it. Some conditioning of all of the spent fuel currently in storage at the SRS may be needed in the future to prepare it for disposal using existing or new facilities at Savannah River Site. In addition, the Department is evaluating whether any of the spent fuel at the site poses safety risks that need to be addressed in the near future.

Mr. Myers. Have you worked out an agreement with the South Carolina Governor on any future shipments?

Secretary O'Leary. No, we have not reached any agreements with the Governor of South Carolina regarding future shipments. We will work closely with the Congress and the State leadership, including the Governor, regarding any future shipments of foreign research reactor spent nuclear fuel.

Mr. Myers. What is your response to criticism that the Department, by taking possession of this fuel, is showing more concern for spent foreign fuel than it is for domestic spent fuel, for which DOE refuses to acknowledge its responsibility?

Secretary O'Leary. The issue with our proposed acceptance or other management of spent nuclear fuel from foreign research reactors is not to assist the foreign reactor operators, but rather to support long-standing United States nuclear weapons nonproliferation policy. All of the foreign research reactor spent nuclear fuel that we have accepted in the past, or which we are proposing to manage in the future, contains uranium that was enriched in the

United States, much of it highly enriched uranium that could be used to produce nuclear weapons. Proper management of this spent fuel is essential to support a basic United States nuclear weapons nonproliferation policy calling for the reduction or elimination of the use of highly enriched uranium in civil programs worldwide. Additionally, the U.S. take-back policy will encourage operators to switch to low enriched uranium. Furthermore, in total, the Department is proposing to accept or otherwise manage up to approximately 19.2 metric tonnes of heavy metal of foreign research reactor spent nuclear fuel. This is a small fraction of the approximately 32,000 metric tonnes of heavy metal of commercial spent nuclear fuel that is projected to be stored in the United States by the end of 1995.

The Department, through the Office of Civilian Radioactive Waste Management, is also moving forward as rapidly as possible with its program for acceptance and ultimate disposition of domestic civilian spent nuclear fuel. As you are aware, there are many challenges ahead for the program.

NUCLEAR WASTE FUND APPROPRIATIONS

Mr. Myers. You have submitted legislation that would provide budgetary off-sets for Nuclear Waste Fund appropriations for the next three fiscal years. The administration proposal contemplates the sale of the United States Enrichment Corporation and directs that amounts equal to the Nuclear Waste Fund appropriations for the next three fiscal years be placed in the Nuclear Waste Fund as an off-set to appropriations. What are your plans for meeting program funding needs if Congress doesn't pass this, or similar legislation?

Secretary O'Leary. The Department's Office of Civilian Radioactive Waste Management program has a dual mandate from the Congress of the United States to characterize the Yucca Mt., NV, site to determine its suitability as a geologic repository. The program must currently compete for available funding against all other "discretionary" Federal programs. As a result, progress at Yucca Mountain, NV, has been funding constrained. Utilities have paid in over four billion dollars to fund this work, but due to current budget scoring, the program cannot use these funds as required to accelerate scientific and engineering activities at the Yucca Mountain site. Legislation is needed to provide a predictable schedule of funding for this program to allow orderly progress toward the milestones which we have outlined in our multi-year program plan.

I want to emphasize that if the Administration's legislative proposal is not passed, I will work with the Congress to develop alternative funding solutions for this program by discussing with you personally our priorities and assessments of impacts of any proposed reduction to our energy programs.

Mr. Myers. Do you plan on submitting off-set legislation every year or every three years?

Secretary O'Leary. The intent of the legislation is to create a new funding approach for the Department's Civilian Radioactive Waste Management Program. Dependent upon Congressional action, the Administration will consider future funding options for the program.

Mr. Myers. What happens after the three year period in the Administration's proposal?

Secretary O'Leary. The Administration has been able to identify budgetary offsets for FY 1996 to FY 1998 related to the sale of the U.S. Enrichment Corporation. At a future time, dependent upon the Congressional action on our proposal, we plan to consider additional budgetary offsets that would fund the program over the five-year period, 1996-2000.

INTERIM STORAGE

Mr. Myers. There is a need to provide centralized interim storage of commercial spent nuclear fuel by January 31, 1998. What are your current plans for providing interim storage.

Secretary O'Leary. As things stand now, there are no practical options under the Nuclear Waste Policy Act for away-from-reactor storage facilities for commercial spent fuel.

However, the Department is maintaining the readiness to develop a centralized interim storage facility if and when a site and the necessary authority and resources are made available. We are also developing the technical and institutional capability for the acceptance and transportation of spent nuclear fuel from reactors to a storage facility whenever such a facility is available. A conceptual design for an interim storage facility has been completed.

Mr. Myers. Do you have funding to provide for this storage and keep the repository program moving forward at the same time?

Secretary O'Leary. Funds for work on an interim storage facility are not included in the Department's FY 1996 budget request of $630 million.

About $50 - $100 million, depending upon the policy instructions provided by the legislation, would be required in FY 1996 to pursue development of an interim storage facility. If additional funds were not provided, the program would have to reprioritize existing activities which would involve postponements in the schedule published December 19, 1994, in the Civilian Radioactive Waste Management Program Plan.

Mr. Myers. What can Congress do to help you meet the January 31, 1998 deadline?

Secretary O'Leary. The most significant assistance that Congress can provide to the Civilian Radioactive Waste Management Program would be to fully support our budget request of $630 million. The funds will continue the momentum the program has attained in FY 1995 toward the goals in our current mission. The FY 1996 funds will ensure our ability to implement the directions Congress has provided in the Nuclear Waste Policy Act and our capability to respond to any new initiatives that the Congress and the Administration may agree upon.

MULTI-PURPOSE CANISTER SYSTEM

Mr. Myers. The Department of Energy is engaging in the procurement of a Multi-Purpose Canister System for storage, transport and disposal of spent nuclear fuel. If DOE does not meet the January 31, 1998 deadline for beginning to accept spent fuel for storage and disposal, then DOE plans on providing the canisters to utilities for on-site storage. What will development and deployment of MPCs cost?

Secretary O'Leary. The funding profile for the development and deployment of multi-purpose canisters, by fiscal year from 1995 through 2000, is shown below:

Year	Funding (millions)
FY 1995	$ 48.9
FY 1996	$ 53.9
FY 1997	$ 54.5
FY 1998	$ 69.5
FY 1999	$ 74.0
FY 2000	$ 74.0

This profile supports the design and certification of the multi-purpose canister system, and fabrication of the first two years' supply of canisters (~150 canisters) to utilities.

Mr. Myers. How much of these funds are devoted to the vendors who will design, license and fabricate the MPCs and how much is devoted to the Management and Operating (M&O) contractor for oversight of this procurement?

Secretary O'Leary. Because the Managing and Operating (M&O) contractor is currently evaluating vendor proposals for the first phase of the multi-purpose canister design contract, the budgetary breakout between vendors and the M&O contractor is considered to be "procurement sensitive."

Mr. Myers. When will the M&O contractor make awards for MPC (subsystem) development?

Secretary O'Leary. The award for multi-purpose canister (MPC) development contract is expected in spring 1995.

Mr. Myers. Has this schedule slipped recently?

Secretary O'Leary. In response to requests from vendors, the period for preparation of proposals was extended by a duration of 10 weeks to November 7, 1994, to enable the bidders to provide more complete technical and cost proposals. The program has stated that the multi-purpose canister subsystem procurement is on an aggressive schedule but it is still anticipated that the first phase design awards will be made in the spring of this year.

Mr. Myers. Will you still be able to make January 31, 1998?

Secretary O'Leary. The Office of Civilian Radioactive Waste Management (OCRWM) is finalizing the multi-purpose canister subsystem licensing strategy with Nuclear Regulatory Commission (NRC) staff interactions to ensure that the critical path activities have been accurately defined and that the durations for NRC regulatory review are realistic based on comparative licensing experiences. A series of Topical Reports will be developed for submission to NRC over the period May 1995 to May 1996 followed by submission of the Safety Analysis Reports in the spring of 1996 for the storage and transportation modes of operation. The Program Plan, issued by OCRWM (December 1994), anticipated that NRC will issue the appropriate Certificates of Compliance by mid-1997. Fabrication could then begin, and MPC's would be available by January 31, 1998.

Mr. Myers. What does NRC say about its ability to certify the MPC's in time to support a January 31, 1998 start of deployment?

Secretary O'Leary. The Nuclear Regulatory Commission (NRC) has stated to the Office of Civilian Radioactive Waste Management that the Commission will be able to support a schedule that will, on the basis of receiving a quality Safety Analysis Report application for Parts 71 and 72 for first round review in April 1996, complete final rulemaking for storage and transportation by October 1998. The Commission acknowledges that there may be some opportunities for improvement in the schedule but cautions that predicting such opportunities at this early stage would be difficult. To expedite its individual licensing review staff work, NRC has established a task force that will integrate multi-purpose canister storage, transportation and disposal activities.

Mr. Myers. What help do you need from Congress to assure that this date is met?

Secretary O'Leary. The Office of Civilian Radioactive Waste Management (OCRWM) program would be significantly assisted by Congress through enactment of the Administration's budget request which will enable the program to continue to implement planned activities in FY 1996 and beyond. Additionally, support for Nuclear Regulatory Commission (NRC) regulatory staff funding in its licensing reviews of OCRWM technical submissions would enable NRC to maintain the required staff support levels.

MANAGEMENT AND OPERATING CONTRACTOR

Mr. Myers. The Management and Operating (M&O) contractor, which now employs over 1,000 people, has come under criticism. What is the quality of the work of the M&O?

Secretary O'Leary. The Management &Operating (M&O) contractor's overall performance, based on recent award fee evaluations, is rated as "Good." Additionally, the Office of Civilian Radioactive Waste Management's (OCRWM) detailed assessment of the M&O's performance for the first three years of its contract concluded that the M&O "has contributed significantly to the accomplishment of OCRWM's goals and objectives" and that the M&O "has demonstrated the technical and managerial expertise required to succeed in fulfilling its mission."

Mr. Myers. Do you think the current arrangement is appropriate?

Secretary O'Leary. The current arrangement reflects OCRWM's contractor restructuring effort. The key to this restructuring is the consolidation of contractor workscope and interfaces under the M&O contractor. The objectives of this restructuring include the elimination of overlap and duplication of effort; improved program/project integration; improved cost-effectiveness and productivity; and the focusing of accountability on the M&O. Considerable progress has been made; more progress is anticipated.

Mr. Myers. Do you have any plans to bring in other major contractors?

Secretary O'Leary. The only other major contractor we anticipate will be a management and technical support services contractor, which will combine services presently performed by several different contractors at the Yucca Mountain Site Characterization Office and Headquarters. We are presently drafting a solicitation for this purpose.

Mr. Myers. What is the M&O's working relationship with the National Labs?

Secretary O'Leary. The M&O is directing the work of a number of the labs through a contractual instrument known as a memorandum purchase order (MPO), a work order for work performed by one integrated contractor for another such contractor. The remaining labs are presently negotiating MPOs with the M&O and expect to conclude them shortly.

Mr. Myers. Do you think implementation of the Galvin Report recommendations will affect the civilian high-level waste program?

Secretary O'Leary. The recommendations of the Galvin report, if adopted, should have no impact on the role of the Department of Energy National Laboratories supporting the Civilian Radioactive Waste Management Program. The main thrust of the Galvin report was that the laboratories should concentrate on their traditional areas of scientific excellence. Nuclear waste management is one of those areas.

YUCCA MOUNTAIN

Mr. Myers. Recent press reports have highlighted concerns raised by Dr. Charles Bowman of Los Alamos National Laboratory. Dr. Bowman speculates that in the distant future, the waste canisters emplaced in Yucca Mountain would corrode away leaving the fissile radionuclides, particularly Plutonium 239 and Uranium 235, to migrate and form a critical mass capable of detonation. What are your thoughts on this theory?

Secretary O'Leary. The release of the paper by Drs. Bowman and Venneri compromised an established scientific review process by reporting on a scientific paper before a formal and vigorous scientific and technical analysis had given it recognition.

Three Los Alamos technical review teams concluded that the authors do not describe a credible sequence of geologic events. These reviews conclude the probability that any necessary step-increases in reactivity to criticality, auto-catalysis, and explosive energy release will occur is small. The probability that all three will occur is vanishingly small. These technical reviews have concluded that even if the steps could occur, any energy release would be too small and slow to produce significant consequences either in the repository or on the surface.

The Department encourages the completion of an orderly scientific review of the paper by Drs. Bowman and Venneri. The Civilian Radioactive Waste Management Program will evaluate any significance the theory may have to ongoing scientific studies at Yucca Mountain.

Mr. Myers. What steps are you taking to review rapidly this new theory and come to an understanding of its relevance to Yucca Mountain as a potential repository?

Secretary O'Leary. The Department recognizes its foremost responsibility is to protect the public and the environment, and considers criticality control one of the key technical issues we face. The Civilian Radioactive Waste Management Program, has assembled a solid team of scientific and technical personnel to analyze and address these as well as other issues related to geologic disposal.

The Department concurs with the recent statements of Los Alamos officials that it is most appropriate for Los Alamos National Laboratory, in consultation with other National laboratories and the larger scientific community, to address and resolve this important issue. The Department believes that the national interest will be best served by allowing this issue to be addressed and resolved in consultation with the scientific community at large.

WIPP

Mr. Myers. Are there any technical reasons that the WIPP site could not be used for storage of commercial spent fuel? If so, what are they?

Secretary O'Leary. It would be premature to make any definitive statement regarding the viability of the WIPP site for the disposal of commercial spent nuclear fuel and high-level radioactive waste. The geologic rock formations at WIPP, primarily the bedded salt deposits in the horizon where disposal would occur, have been extensively studied for disposal of transuranic wastes. Because of the different nature of spent nuclear fuel, primarily its much larger thermal effects and different radionuclide composition, extensive new analyses would be required to assess whether WIPP is suitable for disposal of commercial spent nuclear fuel. These analyses would be on the order of those required to determine the suitability of the Yucca Mountain site, with the exception of those analyses already performed for the WIPP Project.

The use of the WIPP facility as a disposal facility for spent nuclear fuel is not a policy the Department is interested in pursuing. I would not like to refocus the WIPP site for any other than the purpose for which it was intended. I would be inexorably opposed to looking at that site for anything other than transuranic waste. Moreover, in order to determine whether the WIPP site could be a repository for the disposal of commercial spent nuclear fuel, a major site characterization effort would have to be undertaken, similar to the Department's site characterization activities at Yucca Mountain.

POSSIBLE SALE OF THE PMAs

Mr. Rogers: The privatization of the Power Marketing Administrations (PMAs) is certainly getting a lot of attention this year, especially in these times of deficit reduction. How will the privatization actually work?

Secretary O'Leary: The President's proposal is to offer a preferential right to purchase these three PMAs to their existing firm power customers. The sales price would be based on the discounted net present value of the PMA's financial obligations to the Treasury at the time of the sale. The discount rate would be the Treasury's cost of borrowing money at the time of the sale.

The following table summarizes the preliminary estimates of the proceeds from the sale:

PMA Privatization
Analysis 1996-2000
(all $ in millions)

PMA	Date to Privatize	Estimated Sale Price	Net Revenues Lost	Net Revenues To Treasury
APA	end of FY 1996	$ 85	($ 27)	$ 58
SEPA	end of FY 1997	$ 909	($ 431)	$ 478
SWPA	end of FY 1998	$ 612	($ 136)	$ 476
WAPA	end of FY 1998	$ 2,863	($ 194)	$ 2,669
Total		$ 4,469	($ 788)	$ 3,681

The estimated sales prices for Southeastern, Southwestern, and Western Area Power Administrations are based on an earlier calculation of the net present value of the future repayment that Treasury would receive. The Alaska Power Administration has been included to be consistent with the budget document, but the sale price in that case is based on the previously negotiated sale price with the purchasers, consistent with the net present value concept.

The prices on the table are estimates that must be refined once more details concerning the privatization can be explored through a study. The "Net Revenues Lost" column represents the principal and interest payments to the Treasury in the five-year (1996-2000) budget scoring window, offset by the reduction to operating outlays.

The "Net Revenue to Treasury" represents the increase in revenue the Treasury would receive in the five-year (1996-2000) budget scoring window

Mr. Rogers. Have you forwarded your privatization plan to the Congress at this time?.

Secretary O'Leary. No, at this time the Administration has not forwarded a legislative proposal to Congress. However, as draft of the Department's plan is currently working its way through Departmental and interagency clearance and it is expected to be ready for submission to Congress in the near future.

Mr. Rogers. What kind of savings do you expect to realize from this activity?

Secretary O'Leary. Savings would be gained because annual appropriations for these agencies would no longer be required. In addition, the Treasury would be receiving lump-sum payments in 1996, 1997, and 1998 from the proceeds of the sales. As outlined in the President's budget request, there is an anticipated net receipt to Treasury of $3.7 billion dollars over the period 1996 - 2000.

OIL AND GAS INITIATIVES

Mr. Rogers. This Administration in general and you in particular have made exports a high priority -- I read where you and the Vice President were recently in Russia and you have been to China, India, and other countries. On the Russia trip you signed oil and gas deals worth several billion dollars, which I personally think is to be commended.

However, our oil & gas industry right here at home and in my state of Kentucky is hurting, and has been for the past 10 years -- 500,000 jobs lost since 1980; a 75 % drop off in the number of wells drilled per year; and so on. We produce only about a third of the oil our country consumes annually.

My question is, when you have made the exportation of American oil and gas technology such a high priority, why has this Administration basically turned their backs on domestic production?

Secretary O'Leary. The Administration has definitely not turned its back on domestic gas and oil production. We are pursuing many programs and policies to encourage production and to provide opportunities for the domestic industry. The Domestic Natural Gas and Oil Initiative, released in December 1993, contained 49 such actions and we have added to that list since then. The major goal of our technology development programs is to reduce the cost and increase the efficiency of producing oil and gas. We are also helping to reduce costs by working with other Federal agencies and States to implement regulatory streamlining which will reduce duplication and increase efficiency in the regulation of gas and oil operations. Examples of major actions that the Department is working on in 1995 are:

- Advanced Computational Technology Program (ACTI): issue 2nd Call for Proposals for the ACTI Program in June 1995; and expand the Industry Review Panel to include downstream representation. Requesting $48 million for FY 1996 (Action Item 1.1). First Call for Proposals resulted in 31 industry/National Laboratory projects including 149 participants.

- Oil Recovery Class Program: issue the Class IV solicitation for the Oil Recovery Field Demonstration Program in March 1995; award and initiate projects in December 1995. Conduct Class V feasibility study (Action Item 1.3)

- Petroleum Technology Transfer Council (PTTC): support five PTTC regional centers (Action Item 1.5).

- Environmental Technology: initiate field demonstration of Naturally Occurring Radioactive Materials (NORM) and produced water treatment and disposal technologies, and complete analysis of discharges in costal and offshore Gulf of Mexico (Action Item 2.1).

- National Petroleum Council (NPC) Studies: complete the NPC Industry R&D Needs Study in Spring 1995 and incorporate the results in DOE program implementation plans; complete NPC Future of the U.S. Oil and Gas Industry study (Action Item 2.2).

- Gas Delivery: work with the States of Oklahoma and Kansas to adopt the Uniform Production Reporting Model (UPRM) guidelines; assist Kentucky and Texas in their review of UPRM for application to their States (Action Item 3.1).

- Gas Storage and Delivery: working with FERC to expedite certification and construction of natural gas transportation and storage facilities (Action Item 4.3).

- Streamlining Regulations: complete the first phase of the Interstate Oil and Gas Compact Commission study on streamlining regulations for gas and oil exploration and production on Federal lands in California, Colorado, New Mexico, and Wyoming, make decision to proceed with Phase II incorporating additional states if the phase is successful (Action Item 6.1).

- Environmental Regulations: expand assistance to 29 oil and gas producing States to support risk-based regulatory decision making (Action Item 6.2).

- Refining: complete development of the Refinery of the Future initiative, and assist in formulation of alternative compliance strategies for the refining industry as part of EPA's Common Sense Initiative (Action Item 6.3).

- Environmental Regulations: work closely with MMS to develop common sense financial responsibility requirements for offshore facilities to minimize impact of Oil Pollution Act of 1990 on small operators (Action Item 7.5).

- Native Americans: establish a program to assist Native American Tribes with natural gas and oil development (Action Item 8.2).

- Incentives: pursue legislation to lift the ban on export of Alaska North Slope crude oil (Action Item 9.2).

- Incentives: develop revenue-neutral policies for congressional consideration to extend the economic life of marginal wells (Action Item 10.0).

We expect to have other initiatives in the near future. Taken together, these actions will provide significant support to help the domestic industry boost domestic production.

FOSSIL ENERGY FY 1996 BUDGET

Mr. Rogers. Your FY 1996 budget request for fossil R&D is actually a reduction, isn't that right?

Secretary O'Leary No, our FY 1996 budget request represents a 17 8 percent increase over our FY 1995 appropriation for our gas and oil programs In FY 1995, Congress appropriated $198.0 million for our gas and oil research and development programs This is before any rescissions, which we oppose Our FY 1996 request for these same programs is $232.6 million

TAX/FINANCIAL INCENTIVES FOR THE GAS AND OIL INDUSTRY

Mr. Rogers. What has the Department of Energy done with the report and recommendations made by Senator Boren's group last year on the tough problems which our domestic oil and gas producers face?

Secretary O'Leary. Senator Boren's group was formed in response to their concerns over the financial health of the gas and oil industry and their desire to provide financial support to industry during last year's low oil and gas prices The Department of Energy reviewed that report and its recommendations very carefully. We also worked closely with the Independent Petroleum Association of America which provided much of the analysis underlying those recommendations

The Department also commissioned the National Petroleum Council to report on the current state of marginal oil producers in the United States and to recommend actions that the Department could consider to help those producers. We also support, with some modifications, the proposal for royalty relief to help the industry develop marginal new deepwater projects in the Gulf of Mexico originally offered by Senator Johnston of Louisiana and then by the Boren group.

Finally, the Departments of Energy and Treasury have prepared an analysis of alternative tax treatment for geological and geophysical expenses.

GEOTHERMAL ENERGY PROGRAM

Mr. Rogers. This subcommittee appropriated around $40M last year for the DOE to develop a program aimed at promoting the use of geothermal energy as a heat source. Can you give me a quick status report on this effort?

I am interested in this program because I have a very special school in my district, the David School, which is currently installing a geothermal heating system in their new building. (I might add that they decided on their own to install this system with absolutely no funding from this subcommittee). I was hoping you would be able to join me during the dedication ceremony sometime this Spring, since you are perhaps the most talented salesperson we have ever seen at DOE.

Secretary O'Leary. Last year's geothermal program supported a range of research, development and demonstration projects in partnership with stakeholders. These projects included efforts in support of exploration, drilling, fluid production and injection, energy conversion, and the environment. Parts of the geothermal program are aimed at the production of electric power at sites where hot geothermal fluids lie at drillable depths. Other parts are concerned with using "backyard" geothermal energy to reduce power consumption for heating and cooling of residential and commercial space. Geothermal heat pump technology can be used in almost all locations.

The Department has made tremendous progress in establishing a more aggressive geothermal heat pump program, the geothermal technology that the David School will be showcasing in Kentucky. For example, a geothermal heat pump consortium was formed and membership in the consortium totals more than 100, over 70 of which are utilities. Members include 7 of the nation's largest 12 investor-owned utilities, plus rural electric cooperatives, manufacturers, and others. The consortium's goal is to increase geothermal heat pump annual sales from 40,000 today to 400,000 by the year 2000. The leadership and support of the Department of Energy and the Environmental Protection Agency have helped industry to mount a large scale effort to accelerate the swing to energy efficient geothermal heat pumps.

Once you have a firm date for the David School dedication, I will attempt to work the ceremony into my schedule.

ELIMINATING DOE

Mr. Rogers. Several people -- ranging from the President to many members of the Freshman class -- have talked about eliminating DOE. You have apparently persuaded the White House that this is not the best idea, and actually have received a 5.4% increase in your funding request for FY 1996. How did the Administration go from talking about eliminating DOE to proposing an increase in spending for DOE?

Secretary O'Leary. In recent months, some have suggested that, primarily in order to save taxpayer dollars, the new Congress should dismantle the Department of Energy. From both a budgetary and programmatic perspective, it is wiser to downsize and align the Department—our current direction. The Department's several essential and critical missions must be performed regardless of whether they are lodged with the Department or spread among a variety of other agencies. Dismantlement by itself will not produce significant budget savings. A program moved to another agency will still require management and administrative support, and inefficiencies are inevitable due to program disruption. Significant savings can only come from cutting programs or privatizing functions. In reviewing the 1982 Reagan Administration proposal to eliminate the Department of Energy, then Senate Energy Committee Chairman James McClure (R-ID) reached this conclusion.

For FY 1996 we have contained the growth in our programs. When we looked last summer at the combined future costs of our new commitments—in stockpile stewardship, nonproliferation, Soviet-built reactor safety, Climate Change Action Plan, the Energy Policy Act of 1992, as well as new facilities for high energy physics, nuclear physics, material sciences and biotechnology—we saw a curve that went steadily uphill. We realized that in undertaking new activities in response to Congressional and Administration initiatives we were facing a budget that would be out of control within only a few years. Our FY 1996 budget halts this trend. It is a launching pad for a steady and prudent decrease over the next few years toward the more cost-effective achievement of our missions.

The $300 million increase in the FY 1996 budget versus FY 1995 reflects critical new initiatives in the national security and science areas, in particular, programs and facilities to ensure confidence in the nation's weapons stockpile, given the moratorium on underground testing. It also reflects the costs of downsizing, particularly in Environmental Management, where up to $200 million will be required in FY 1996 for major work force reductions.

We have made great progress in carrying out our missions at a lower cost and with fewer employees. Almost within our first month at the Department, we identified a way to save $1.55 billion over five years by freezing contractor salaries for a period of one year. We have moved to performance-based contracting. Implementing this change at our Hanford facility alone will save an estimated $1 billion over the next five years. The Department will be re-competing over $40 billion worth of contracts in the coming years to establish contract reforms. In all, we expect these reforms to save over $5 billion in the next five years.

The Department has committed to saving $14.1 billion through FY 2000 in support of the President's plan to cut taxes for middle class Americans and further reduce the deficit.

Over the coming five years, we will cut $8.4 billion from our programs and sell assets worth an estimated $5.7 billion. The result will be a Department that is more focused on missions of critical value to the nation: advancing U.S. leadership in science and technology, safeguarding national security, cleaning up the Cold War environmental legacy, and securing an affordable, sustainable and productive energy future.

In December, building on our Strategic Plan, we began an initiative to strategically align our activities to reflect changing world conditions and changing demands on our science and technology infrastructure. A task force of the Department's employees is conducting an intensive four-month review of our activities, targeting for elimination redundant or unnecessary work and management layers. We will overhaul or eliminate lower priority programs and identify work that would be better performed elsewhere. We have also asked a task force led by Dr. Daniel Yergin, Pulitzer Prize winning author and President of Cambridge Energy Research Associates, to look at how we can improve our energy research and development work. The task force will submit its recommendations in June.

As you know, over the past year a task force headed by Bob Galvin, chairman of the executive committee of Motorola, has been examining the role of our national laboratories. The Galvin Task Force has clearly and forcefully validated the importance of the major research and development missions of the Department and its laboratories. The report also recommends that the Department's laboratory system be downsized through management efficiencies and the elimination of functions and redundancies. These recommendations will provide the means for a more efficient and cost-effective Department laboratory system than ever before. We will ask the full Secretary of Energy Advisory Board to assist in further assessing this proposal and its implications.

The $14.1 billion in reductions that we propose the Congress and the Department achieve over the next five years will have to come from three sources. We must cut some programs, sell some assets the government no longer needs, and continue to increase our productivity and cost-effectiveness. We will build on the momentum already established at the Department to institute historic budget cuts and management improvements. When we have finished—and our Strategic Alignment Initiative will contribute greatly to this effort—we will all see that the missions that remain are vital to the nation and belong together.

STATUS OF UNITED STATES ENRICHMENT CORPORATION

Mr. Rogers. Would you provide a brief status report on the United States Enrichment Corporation (USEC) and AVLIS to me for the record. As you know, I have a few colleagues in the western part of my state (Paducah, KY) who are very interested in the developments there.

Secretary O'Leary. The United States Enrichment Corporation (USEC) began operating the Department's gaseous diffusion plants at Piketon, Ohio, and Paducah, Kentucky, on July 1, 1993, as a wholly-owned Government corporation. While the plants are being operated by the Corporation, the Department of Energy continues to own the plants and lease them to the Corporation. As a result, the Department is involved in a number of interdependent activities with USEC. These activities range from regulatory oversight and compliance activities to transparency measures associated with USEC purchases of Russian low enriched uranium.

On July 13, 1994, USEC's Board of Directors authorized its management to begin working towards the commercialization of the Atomic Vapor Laser Isotope Separation (AVLIS) technology. Currently, the Department is providing its AVLIS facilities at the Lawrence Livermore National Laboratory on a reimbursable basis for USEC to continue to explore the commercial feasibility of this technology. The AVLIS facilities provided to USEC include laser and isotope separation systems, plant-scale demonstration facilities, and associated research and development equipment. As provided in the Energy Policy Act, the Department is negotiating an agreement with USEC covering royalties and the transfer of AVLIS property and facilities. While USEC has announced no final decision on whether it will actually build an AVLIS facility, the Corporation is still pursuing development activities at Lawrence Livermore National Laboratory.

USEC is in the process of formulating a privatization plan to be submitted to the President and Congress by July 1, 1995. While new legislation is not required to privatize the Corporation, technical legislative changes to existing law may be needed. The Corporation and the Administration are currently reviewing several such changes.

For a more detailed report on the status of USEC and AVLIS, I would suggest that USEC be contacted directly.

POSSIBLE SALE OF THE PMAs

Mr. Bevill: Why does it make sense for the government to get out of the power business when revenues from hydroelectric sales were designed to help pay for the joint cost of the other projects from a multi-purpose facility?

Secretary O'Leary: With the exception of $1.6 billion in Aid to Irrigation at Western Area Power Administration projects, the PMAs only repay those costs associated with the investment in power facilities, including power's share of the projects's joint-use facilities (eg. the dam itself). The PMAs do not pay other costs and, in fact, are prohibited from doing so except as authorized by law. The PMAs have met the goal set out initially by the Government in developing these facilities. Their functions should now be performed by non-Federal entities. It makes sense to privatize four of the Department's PMAs for three reasons:

1. Non-Federal entities can operate and provide investment capital for these systems in a more cost-effective manner than the Federal government.

2. Privatization will localize control, allowing local decisions to be made by the people most affected. In addition, it will reduce the size of government.

3. Privatizing the PMAs will accelerate the repayment of Federal debt. One-time payments of PMA debt will be paid to Treasury in 1996, 1997, and 1998. The Administration will be asking for changes in the budget scoring rules so PMA privatization , and other asset sales, will "score" as budget savings.

DEPARTMENT OF ENERGY/EXPERIMENTAL PROGRAM TO STIMULATE COMPETITIVE RESEARCH (DOE/EPSCoR)

Mr. Bevill. The National Science Foundation created the Experimental Program to Stimulate Competitive Research in 1979 in response to concerns expressed by this Committee about the geographic concentration of federal funding of academic research and development. EPSCoR is designed to stimulate better research and increase the ability in states that traditionally have lacked strong university-based research efforts to compete for federal research support. This Subcommittee authorized an EPSCoR program at the Energy Department in the Energy Policy Act of 1992. Please provide a status report on DOE's EPSCoR program.

Secretary O'Leary. As of FY 1995, only the fifth year of the DOE EPSCoR program, seven of the EPSCoR states have received research implementation awards of up to $1.25 million; 13 have received graduate student traineeship awards that range from $220,000 to $950,000; and all 19 have received planning awards of approximately $100,000.

The FY 1996 funding request for the program is $2.1 million. Subject to a satisfactory progress review, the requested funding will be used to sustain the activities of the three states that began their research implementation programs in FY 1994, albeit at a reduced rate. At this level, no new research implementation awards will be funded in FY 1996

Already apparent in the EPSCoR states are a variety of infrastructure building activities and interactions that will enhance these states ability to better compete for federal research support in the future. This progress is evidenced by formulation of faculty from different universities combining their resources to mount larger research efforts, collaborations between the academic community, federal agencies and industrial partners; and the state legislatures and governor's offices becoming involved in efforts to develop strategic plans to use state resources to support a science and engineering infrastructure within their states.

DOE is also benefitting in a number of ways. Because the DOE EPSCoR program has been structured to encourage collaboration between the Department's national laboratories and the academic community, significant outside expertise is being directed toward studying energy-related research questions. Further, as the program places heavy emphasis on the involvement of students in the research activities of the participating faculty and laboratory staff scientists, DOE is developing a talented, diverse future workforce needed to accomplish its mission.

Mr. Bevill. The Department has developed an implementation plan designed to keep this program highly competitive. Please describe this five-year implementation plan as it was highlighted in OSTP's July Report to Congress on the EPSCoR program.

Secretary O'Leary. As detailed in the OSTP's July report to Congress, an implementation plan was developed that would result in a robust, highly-competitive EPSCoR program at the Department of Energy. As part of this plan, the DOE EPSCoR project proposed to continue its graduate student traineeship support and to initiate a new element to allow the program to develop additional faculty expertise in energy-related sciences As described in the July Report to Congress, the Department suggested the start of a Faculty Enhancement Awards Program that would enable competitively selected faculty to become involved in research programs at the Department's national laboratories. Over the five-year period of the implementation plan, between 20 and 40 such awards would be made. Faculty who participated in this program become the nucleus around which subsequent research implementation applications are developed Such a program is particularly valuable to those states that have been unsuccessful in their attempts to secure a DOE EPSCoR implementation award

Further, to allow the states to develop the infrastructure and personnel required to sustain nationally-recognized, competitive research programs, the Department envisions providing 9 of the 19 states with research implementation awards of up to $1 25 million a year for 5 years. The one-to-one match of non-Federal resources will continue to be mandatory

Mr. Bevill. Is the Department's current budget adequate to meet the program's stated goals and objectives as outlined in your implementation plan?

Secretary O'Leary. The FY 1995 budget of $7.0 million will require downsizing and modification of the goals and objectives outlined in the *Office of Science and Technology Policy Report to the United States Congress on the Development and Integration of the Experimental Program to Stimulate Competitive Research*, July 1994

Mr Bevill The 1992 Energy Act directs the Office of Energy Research to operate the DOE EPSCoR program. Currently, the program is administered through the Office of Science Education and Technical Information Is the DOE EPSCoR program "housed" in the proper organization, one that will result in the maximum benefit for the program?

Secretary O'Leary Yes, it is. Beginning in FY 1991, the DOE/EPSCoR program has been managed by the Office of University and Science Education Programs, which was part of the Office of Energy Research at the time. In March, 1993, the Department was reorganized and the programs and staff of the Office of University and Science Education Programs were placed into the newly created Office of Science Education and Technical Information Because of the unique dual nature of the DOE/EPSCoR program, one that includes a strong education emphasis, the Office of Science Education and Technical Information can utilize its expertise in building the required infrastructure that will allow the EPSCoR states to develop competitive research programs.

The DOE/EPSCoR program places significant emphasis on developing the EPSCoR states' research infrastructure and on enhancing science, mathematics, engineering and technology education in these states. The research needs and interests of the EPSCoR states span a breadth of areas that exceed those supported by the Office of Energy Research. The Office of Science Education and Technical Information ensures that its expertise with respect to the EPSCoR program is supplemented by the involvement of a variety of the Department's technical program offices (including the Offices of Defense Programs, Energy Efficiency and Renewables, Energy Research, Environmental Restoration and Waste Management, Fossil Energy, etc.)

NATIONAL BIOMEDICAL TRACER FACILITY

Mr. Bevill. A recent report by the Institute of Medicine on Isotopes for Medicine and the Life Sciences has highlighted several areas in which DOE can play a role in easing shortages. Perhaps the most critical problem is the shortfall in the availability of accelerator-produced radionuclides due in part to the reduced operating schedules at LAMPF (LANL) and BLIP (BNL). The panel strongly endorsed the construction of the National Biomedical Tracer Facility or NBTF. What is the status of the $3 million dollars appropriated for FY 1995 to continue work on this facility?

Secretary O'Leary. The $3 million dollars for FY 1995 was for possible augmentation of the Project Definition Studies for the development of site-specific designs of the National Biomedical Tracer Facility. These Studies have been submitted to the Department and will be evaluated for their scientific and technical merits by a panel of experts on March 27-28, 1995. Based on the results of this evaluation, we will consider the possible augmentation of the Studies.

Mr. Bevill. Given the importance placed on this facility both as a source of radionuclides and as a facility for education and training, would you provide information on the Department's plan for keeping this facility on track in FY 1996 and 1997?

Secretary O'Leary. Based on the evaluations scheduled on March 27-28, 1995, and the recommendations of the Institute of Medicine, we will decide whether it is prudent and cost-effective to augment the Studies for the development of site-specific designs of the National Biomedical Tracer Facility. Alternatively, we may adopt the Brookhaven National Laboratory proposal to upgrade and modify the Brookhaven Linac Isotope Producer to serve as both a source of radionuclides and as a facility for education and training. We expect to reach a decision by June 15, 1995, and will establish an appropriate funding plan.

Mr. Bevill. Are there plans for including construction funds for the NBTF in the FY 1997 budget?

Secretary O'Leary. Based on the evaluations of the Project Definition Studies and the recommendations of the Institute of Medicine, funding requirements for the National Biomedical Tracer Facility will be considered during formulation of the FY 1997 budget request.

INTERNATIONAL PROGRAMS

Mr. Bevill. The FY 1996 DOE budget contains a request of $74 million for the continuation of the program to assist Russia in making their nuclear power plants safe. These funds were previously provided in the Foreign Operations bill. Why have you decided to request funds in the DOE budget, and what would the impact of providing no funds be?

Secretary O'Leary. Funds for this program were initially provided through the Agency for International Development and were aimed at near-term risk reduction activities. Since then, it has become evident that there is more work to do in the area of safety of Soviet-designed reactors. Lasting improvements will depend upon a sustained effort to improve not only the physical condition of the plants but also the nuclear safety culture and infrastructure needed for safe operation. An effective mechanism for funding this work is through the Department's International Safety Program, a cooperative effort which links us with partners in other countries to improve nuclear safety worldwide. Funding our work as part of the DOE budget would be more effective than transferring funds from AID as there would be less administrative overhead and the funds would not be subject to added time delays which accompany inter-agency transfers.

The benefits to the United States of this cooperative program are clear:

- Reduce national security concerns related to the unsafe operation of Soviet-designed reactors, including the regional and economic instability that would result from another major nuclear accident
- Reduce potential impacts to U.S. industry from an accident in another country
- Introduce U.S. engineers and manufacturers to new technologies, such as Russia's reactor vessel annealing techniques, and open new markets for U.S. industry
- Maintain U.S. global leadership in the nuclear field

The impact of providing no funds would be that countries with Soviet-designed reactors would not be able to obtain and implement needed operational safety and nuclear infrastructure improvements, and would therefore continue to operate at greater risk of an accident. As one example, our program to implement Emergency Operating Procedures in the plants would end, and the plant operators would not have these important safety procedures available.

BUDGET CUTS

Mr. Bevill. Since funding the area of energy efficiency, solar and renewable energy and environmental management are perhaps the most vulnerable to cuts at the moment, can you comment on the effect of cuts in these areas.

Secretary O'Leary. There are limits to how large and how fast budget reductions can happen without jeopardizing our ability to meet our obligations to protect human health and safety. The Environmental Management program has already achieved productivity improvement savings of more than $2.1 billion from FY 1993 to FY 1996. In addition, we are already contributing significantly to the President's program to reduce spending and the deficit, and have planned $4.4 billion in budget cuts over the next few fiscal years (1997 to 2000).

I believe these reductions are achievable and necessary, but there are dangers in cutting too much too fast. The Environmental Management program has obligations to protect human health and safety from some of the nation's most urgent environmental risks. There is much to do, and we will continue to make significant progress in addressing our responsibilities provided we are given adequate resources. However, additional reductions in our resources have the potential to seriously undermine our capability to carry out our responsibilities.

Excessive cuts could have severe impacts on our ability to reduce environmental and safety risks, eliminate long-term threats that could be passed on to future generations, and develop the necessary technologies to do this job and increase America's competitiveness in the burgeoning global environmental technologies market.

There are not unlimited efficiencies that can be gained by cutting this budget. The Department is dealing with some of the highest risks in the world today, such as potentially explosive underground radioactive waste tanks and unstable weapons-usable plutonium. We have a duty to protect the safety of the workers at these dangerous facilities and the communities that surround them.

Let me emphasize that this goes beyond compliance with our legal commitments. Beyond falling short of meeting all of our previously negotiated commitments--which will certainly happen unless we successfully renegotiate many of our agreements--our efforts to stabilize and safeguard nuclear materials and contaminated buildings will be compromised.

With regard to budget reductions for Energy Efficiency's Solar and Renewable Programs, funding reductions in fiscal year 1996 programs for solar and renewable energy would occur at a most inopportune time in the evolution toward maturity for these technologies. The past decade of research and development investments has resulted in significant performance advancements and cost improvements for all renewable systems. Recent shifts to deployment activities have shown signs that the U.S. is poised to achieve major returns on its technology advances. Market inroads are beginning to develop. U.S. firms are reflecting bullish attitudes toward the potential for renewable. Cost sharing is at record highs. Key utilities are displaying a willingness to consider renewable in their generation planning. For state-of-the-art installations, renewable system performance appears to be meeting utility standards, an important requirement for market growth. Removal of the government share in these ongoing technology-to-marketplace transitions threatens the process with collapse and repeats past U.S. failures to reap the rewards from national technology investments.

Mr. Bevill. While many people are talking about the need to reduce the budget of the Department of Energy, the actual request goes up in FY 1996, from $17.5 billion to $17.8 billion. However, DOE is expected to reduce its budget by $14.1 billion over the next five years. These cuts are to come from a combination of spending cuts, sale of assets and the privatizing to the Power Marketing Administration. Madame Secretary, if Congress were to accelerate your plan to reduce the Department's budget by requiring a reduction of 10 percent or say $2 billion in this fiscal year, how would you react?

Secretary O'Leary. My experience with the private sector has taught me that moving too hastily without adequate planning leads to downsizing efforts that are not successful. At DOE, we are doing all we can to bring down the cost of work on behalf of the taxpayer. We must do so prudently, however, and this will take both time and additional expenditures. A wisely managed transition to a smaller, more effective Department will require careful planning and some new costs in the short run.

It will, for example take time to receive appropriate congressional approvals and divest assets as significant as the Power Marketing Administrations and the Naval Petroleum Reserves. We want to be sure that the taxpayer's investment in these national assets show a valuable return.

Mr Bevill. Could any of the proposed asset sales or privatization efforts be accelerated. What are the obstacles to this?

Secretary O'Leary. The Administration needs congressional authorization in order to sell Power Marketing Administration or Naval Petroleum Reserve assets. The Administration is planning to submit a legislative package to Congress in the near future for the Power Marketing Administrations and a legislative package for the Naval Petroleum Reserves within the next two months.

TRITIUM PRODUCTION

Mr. Bevill. DOE is currently studying whether and how to address the issue of tritium production. Reportedly DOE is studying five potential sites, and also is addressing whether to build a multi-purpose reactor or a linear particle accelerator. Can you comment on this ongoing work and tell us when the Environmental Impact Statement is due.

Secretary O'Leary. The Department published the Draft Programmatic Environmental Impact Statement (PEIS) for public review and comment on March 1, 1995. The PEIS evaluates four technologies for a new tritium source: Heavy Water Reactor, Modular High-Temperature Gas Cooled Reactor, Advanced Light Water Reactor, and Accelerator Production of Tritium. The Draft PEIS also evaluates the option of using an existing commercial light water reactor to make tritium, whether as a contingency option in the event of a national emergency, or should the Department choose to purchase an existing reactor and convert it to defense purposes. All four new tritium supply technologies are currently judged to be capable of meeting the 2011 date for a new tritium source and meet the required quantities. The PEIS also analyzes the option of using a single reactor to produce tritium, dispose of plutonium and generate electricity ("Triple Play Reactor"). The candidate sites being examined for the new tritium facility are the Savannah River Site, the Idaho National Engineering Laboratory, the Oak Ridge Reservation, the Nevada Test Site and the Pantex Plant. The Draft PEIS did not include a preferred option for either technology or site, however a preferred alternative may be announced prior to the completion of the Final PEIS. Public hearings will be held at the five candidate sites and Washington, D.C. in March and April 1995. The final PEIS will be released in October and a Record of Decision in November 1995.

SAVANNAH RIVER SITE - TRITIUM PRODUCTION

Mr. Bevill. Could you comment on recent allegations of a connection between this site decision and the issue of the storage of spent nuclear fuel from Europe reactors at the Savannah River Site in South Carolina.

Secretary O'Leary. There have been discussions with the Congress and officials of South Carolina concerning both a new tritium source and the return of spent fuel from foreign research reactors. No final decisions have been made on either issue.

GALVIN COMMISSION REPORT

Mr. Bevill. The Galvin report was particularly critical of DOE environmental management process. Can you comment on what strides you have taken in the past two years to correct the problems inherited from the previous administration?

Secretary O'Leary. The Galvin Commission Report had much to say about the Environmental Management program, and the Department agrees with many of the recommendations. However, where I believe the Commission fell short was in the timeliness of its analysis. Many of the findings on which they based their recommendations may have been true in the past, but not relevant to present circumstances in the program.

For example, the report recommends establishing an "Environmental Advisory Board." The Department created such a board in 1990 and recently expanded its membership to 28 members, including a representative from the National Laboratory community. Furthermore, the report recommends "improvements in DOE management." The Environmental Management program has implemented significant changes in the way it does business with contractors, the public, and within its own programs. Cost savings of approximately $2 billion are expected to be realized from FY 1994 to FY 1996, and more public access and involvement in decisions is available and will continue to be fostered.

In 1993, the Environmental Management program was four years old, but was still operating under the same inappropriate paradigms that it had inherited. The Department continued to rely on nuclear weapons production contractors to perform environmental management tasks. Instead of recompeting contracts for the new "cleanup" mission, the Department simply layered on additional personnel, resulting in a very inefficient system. Since then we have recompeted and awarded several new contracts, and are in the midst of reducing the size of the contractor workforce by 18,000 employees.

I would like to include a point-by-point response to the specific recommendations of the Galvin Task Force pertaining to the Environmental Management program for the record.

U.S. Department of Energy
Response to the Final Report of the Task Force on Alternative Futures for the Department of Energy National Laboratories ("Galvin Report"):
Chapter IV - "The Environmental Cleanup Role."

The Task Force commented on the Department's Environmental Management program, which is largely outside the scope of the Task Force and outside the principal expertise of most members. As a result, some of the recommendations are based on incorrect assumptions or misconceptions about the National Laboratories' role in the Environmental Management program. The Task Force report is weakened by flaws in information and analysis.

Attachment A provides a detailed side-by-side response to each of the eight recommendations made by the Task Force regarding the Environmental Management program. Some of the key points are:

- We have and will continue to use the laboratory system to the extent it can compete in producing useful results in a cost-effective manner, compared to other sources of research and technology. The Department has already worked successfully with the laboratories to develop a number of new environmental technologies.

- The Department agrees with the general recommendation that risks should be addressed "with a heightened sense of urgency." However, the Department disagrees that this urgency should necessarily be applied to those sites "presenting no immediate threats to public health or safety" as the Task Force suggests. The Department intends to continue addressing the most urgent risks first, while investing in necessary technology development to increase the effectiveness and reduce the costs for non-urgent risks on which steady progress is made to avoid passing on liabilities to future generations to the extent possible.

- The Task Force suggests several actions that have already been taken, including: establishment of an advisory board, strengthening management, placing a high priority on the environmental mission of the Department, and effectively engaging the public in decision making processes.

Attachment A

Response to Final Report of the Task Force on Alternative Futures for the Department of Energy National Laboratories

Recommendation	Department of Energy Response
1)"[I]mprovements in DOE management and leadership are needed..."	**SUPPORT/COMPLETED.** **Commitment:** The Task Force seems to be unaware of the substantial progress the Department has already made in improving the management capabilities in the environmental management program at all levels. The Department has significantly increased management capability by hiring and training competent project managers, cost estimators and contract coordinators. This new management capability has already resulted in a savings of more than $500 million in the Environmental Management program. Also, the Quality Improvement Team concept (QIT) has afforded the Department continuous improvement in its managerial enterprises. **Deadline:** Continuous improvement in management capabilities will be an ongoing priority for the Environmental Management program.
2)"[T]he EM program [requires] a substantial commitment and high priority addressing the challenges of this program."	**SUPPORT/COMPLETED.** **Commitment:** It is unclear why the Task Force suggests that the Department has not made a "substantial commitment" or made environmental management a "high priority." With an annual budget of more than $6 billion, the Environmental Management program is the largest environmental program in the world, and, since FY 1994, has been the largest program in the Department of Energy. The level of commitment and priority necessary for this program will be continued. **Deadline:** Ongoing.

3)"[Establish] an 'Environmental Advisory Board (EAB),' reporting to the Under Secretary."	**COMPLETED.** __Commitment:__ The Department already has established several advisory boards and independent reviews to service the Environmental Management program. We are committed to continued utilization of: (1) an existing Environmental Management Advisory Board (EMAB), (2) two ongoing studies by panels of the National Academy of Sciences, (3) the Development of On-site Innovative Technologies (DOIT) Committee, and (4) numerous Site Specific Advisory Boards. The EMAB was established in 1990 to help guide policy. The board now consists of 28 members representing a wide range of organizational perspectives and fields of expertise including the National Laboratories. Several EMAB committees have been established to address key issues affecting both the Department and the Environmental Management program, such as risk management, cost-effective cleanup, and technology development and transfer. The task force apparently was unaware of this board. __Deadline:__ Ongoing utilization of existing advisory boards.
4) "The national laboratories [should play a larger role] than at present in...the Environmental Management program."	**SUPPORT WITH QUALIFICATIONS.** **Commitment:** The Department will continue to provide strong support to the National Laboratories for environmental cleanup technology development. Currently, DOE laboratories receive $200 million (50%) of the funding out of the approximately $400 million annual Environmental Management technology program. Lead labs recently have been established for the major Environmental Management Technology Development Focus areas, as recommended in the Task Force report. Cost and performance of the DOE labs vis-a-vis other R&D performers will provide the basis for decisions regarding funding allocations. Efforts to reduce the cost of business at the National Laboratories should enhance their competitive position for funding increases in this and other areas of R&D. __Deadline:__ Ongoing

5) "[The] national laboratories [should be] available to the entire government system as a powerful environmental technology resource."	**SUPPORT.** **Commitment:** The Department will work with other government agencies to help facilitate enhanced utilization of the laboratories in areas where their environmental technology capabilities might help provide cost-effective approaches to clean-up challenges. **Deadline:** Ongoing.
6) "DOE must address more forcefully the task of renegotiating the unrealistic or unfeasible elements of the cleanup compliance agreements that it has made with State and Federal agencies."	**SUPPORT.** **Commitment:** The Department is continuing to renegotiate many of its compliance agreements to create a more workable and results-oriented compliance regime. Considerable progress has already been made, including, the 1993 renegotiation of the Hanford agreement at a savings of more than a billion dollars, and renegotiation of dozens of smaller agreements throughout the country. The Department is committed to making structural changes to our compliance agreements to provide the necessary flexibility because of shifting site conditions and budget realities. For example, we are seeking to replace elaborate long-term enforceable schedules with enforceable shorter-term schedules with greater emphasis on results-oriented milestones rather than process milestones. **Deadline:** Ongoing.

7) "Much more comprehensive involvement by members of the affected public in decision making should be employed to reduce the bitterness, distrust and distress that continues to provide a troublesome element in DOE's conduct of affairs."	**SUPPORT/PARTIALLY COMPLETED.** **Commitment:** The Department agrees that more public and stakeholder involvement is needed and has already taken a number of actions to accomplish this goal. For example, in the Environmental Management program, the Assistant Secretary established the Office of Public Accountability. Other initiatives include the expansion of the Environmental Management Advisory Board, the formation of Site Specific Advisory Boards (SSABs) at many DOE sites, and a technology development program that incorporates public input. Since 1993, "Establishing a stronger partnership between the Department of Energy and its Stakeholders" has been one of the six strategic goals of the Environmental Management program. **Deadline:** Ongoing.
8) "The bulk of EM environmental challenges, although presenting no immediate threats to public health or safety, still should be addressed with a heightened sense of urgency."	**SUPPORT WITHIN BUDGET LIMITS.** **Commitment:** Although the Department generally agrees with this statement, limited resources will ultimately direct the pace at which these risks can be addressed. Hence, the Environmental Management program's first strategic priority is to "Eliminate and manage the urgent risks in the system." This goal reflects the reality of limited resources available to the Environmental Management program. Some actions must be deferred where there is no near-term urgent risk, and to invest in new technologies that will reduce the cost and increase the effectiveness of a more sustainable remedy. This strategy recognizes the need to focus available funding on existing urgent risks and to identify emerging risks, while developing productive and cost-effective technologies for the long-term success of the program. **Deadline:** Ongoing.

Mr. Bevill. When do you anticipate that the recommendations regarding consolidation or integration of missions at DOE labs will be implemented and how much will it save?

Secretary O'Leary. The Department's response to the Galvin Task Force report was contained within a March 8, 1995, report to the National Science and Technology Council. That report commits the Department to develop an interim Strategic Laboratory Mission Plan by July 1995, and a final plan by December 1995. This plan will provide more focussed missions for the DOE laboratories, and will create the framework for adjusting the size of the laboratories according to changes in federal funding. The savings will depend, in part, upon congressional decisions regarding the amount of funding to be provided for programs in the Department's four major mission areas of energy R&D, national security, fundamental science, and environmental clean-up. In addition, the Department's report to the National Science and Technology Council commits us to complete by April 15, 1995, a strategy in response to the Galvin Task Force recommendation regarding the possible consolidation of activities within the defense program laboratories. The budgetary implications of such an action are not yet known.

BIOFUELS TRANSPORTATION SECTOR

Mr. Fazio. As you may recall from the FY 1995 Bill, this Committee directed the Department to study the siting of a biomass powerplant fueled primarily by rice straw to be sited in the central valley of California. In response to that directive, several entities within my district have responded with proposals to build such a facility.

In particular, the City of Gridley in Butte County, California, has come forward with a proposal to build a facility that will use rice straw as the feedstock. The University of California Davis is also contributing scientific expertise to the planning of the project.

Before I begin my questions, I want to thank you, Christine Ervin, and the other people in your Department for helping the City of Gridley get plugged into the process. Gridley has had excellent response from the folks in the Department as well as representatives from NREL, the California Energy Commission, the rice industry, and utility industry representatives.

California has taken a strong step toward cleaning up the air by eliminating the burning of rice straw. This project is of particular importance given the gradual phasing out of rice straw burning.

So I just want to thank you on behalf of the City of Gridley and ask that the Department continue to provide the excellent support that it has thus far for this important project.

In particular I strongly urge you to protect Biofuels Transportation Sector from budgetary pressures so we can continue this excellent public-private partnership.

Does the budget submission sufficiently support the Biofuels Transportation Sector?

Secretary O'Leary. It is our belief that the Department's FY 1996 budget submission for Biomass Fuels Transportation Sector is adequate to sustain the momentum already gathered in the area of alcohol fuel production. This funding allocation will ensure that program goals and objectives outlined in the Biofuels Strategic Plan are carried out. The study you refer to concluded that use of rice straw has numerous difficulties and that it is not currently a very promising feedstock for economical biomass power.

Mr. Fazio. What direct and indirect export potential exist for such programs?

Secretary O'Leary. Through DOE's strategic planning process, industrial competitiveness was identified as a critical element in fostering the Department's outlook for the future. With the assistance of DOE laboratories and facilities, and in concert with the Commerce Department, the Department of Energy encourages the active participation of industry in the export of alcohol technologies abroad. The direct market potential for the fuel alcohol will be determined by industry.

THE GEYSERS PIPELINE EFFLUENT PROJECT

Mr. Fazio. Thank you also for your continued support of The Geysers Effluent Project. I understand that there is $2 million in the budget request to continue this project. Is this figure correct?

Secretary O'Leary. The Department is planning to allocate $2 million to The Geysers Effluent Project.

Mr. Fazio. Please provide for the record a brief update on the progress of this important project.

Secretary O'Leary. In FY 1994, the Department worked with Lake County and other agencies to complete the environmental impact report covering the effluent pipeline for reservoir injection at The Geysers. The environmental impact report is now being reviewed by the Environmental Protection Agency. The Lake County Sanitation District estimates that pipeline construction will begin in June 1995, with the project becoming operational in the second half of 1996.

Mr. Fazio. Are sufficient funds available to keep this project on an optimum schedule for completion?

Secretary O'Leary. The funding for The Geysers Effluent Project is from a wide variety of sources including county, state, federal, and private sources. The Department's contribution is a relatively small percentage. There is a question as to whether Lake County will have sufficient county funds to upgrade its wastewater treatment plant.

POSSIBLE SALE OF THE PMAs

Mr Fazio: As you know, there has been a lot of discussion about downsizing government. The President's budget request includes plans to sell the Power Marketing Agencies the "PMAs," including WAPA.

The Administration's stated position in implementing this policy calls for meeting two very different goals. On the one hand, the Administration wants to make sure that ratepayers are held harmless if the PMA's are sold. On the other hand, the Administration also has ensured the federal taxpayers that it will maximize the Federal interest when it sells the PMAs.

I believe that the Administration has a very difficult task ahead if it wants to succeed on both fronts. I want to discuss the general principle of the selling off of the PMAs.

Can you give me a brief update on the proposal to sell the PMAs.

Secretary O'Leary: For decades the PMAs have done an excellent job of meeting the needs of their customers and accomplishing the purposes for which they were authorized. However, due to Federal procurement, personnel, budgeting and other laws, Federal operation of these systems is more costly than if local customers and communities were to run them in the manner of the best utilities. Privatization will increase efficiency and responsiveness to local concerns.

The Administration believes that selling the PMAs is in the best interest of both the ratepayers and the taxpayers. By basing the selling price on the discounted net present value of the PMA's financial obligation to the Treasury at the time of the sale, the Administration believes this will be accomplished with no rate increases to the ratepayers. Treasury will receive up front the payments that are owed and, with a change to existing budget scoring rules, these lump-sum payments will reduce the budget deficit on an accelerated basis.

Mr. Fazio: Has the Department considered how the sale of the PMAs would relate to the sale of the Federal water project in California, the Central Valley Project?

Secretary O'Leary: No, the Department has not yet considered what impact the power facility sale would have on the water operations of the Central Valley Project, however, as we proceed through the development of the PMA privatization proposal, this issue and others associated with the transfer of the Central Valley Project water facilities and operation to sate ownership will be included in our review.

Mr. Fazio: What is the timeline for any sale of the PMAs?

Secretary O'Leary: The timeline for the sale assumed in the President's proposal is as follows:

PMA	Date to Privatize
APA	end of FY 1996
SEPA	end of FY 1997
SWPA	end of FY 1998
WAPA	end of FY 1998

Mr. Fazio: Has the Department finalized the terms and conditions for the proposed sale?

Secretary O'Leary: The Administration is committed to the general principles that 1) the PMAs be sold for the discounted net present value of the PMA's financial obligations to the Treasury at the time of the sale, and 2) a preferential right of purchase be given to the existing firm power customers of the PMA.

Mr. Fazio: How would parties interested in the sale of the PMAs learn about the process?

Secretary O'Leary: Parties interested in the sale of the PMAs can contact:

Robert Nordhaus
DOE General Counsel
Rm: 6A-245, Forrestal Building
1000 Independence Ave., S.W.
Washington, DC 20585

202/586-5966

Mr. Fazio: Will you designate a point of contact within the Department for those who are interested in the purchase of the PMAs?

Secretary O'Leary: Yes, DOE's General Counsel, Robert Nordhaus, has been appointed the point of contact on the PMA privatization issue.

NATIONAL IGNITION FACILITY

Mr Fazio. The Galvin Report that you requested supports the National Ignition Facility, better known as the "NIF". As you may know, I am also a supporter of this proposed facility. The so-called "Jasons" are a highly prestigious group of senior scientists which has advised the government on defense matters since the Manhattan Project was disbanded in the late 1940s As you know the Jasons very strongly supported the NIF as a critical element of the stockpile program and as central to maintaining the U.S. scientific capability to cope with nuclear weapons problems such as proliferation and terrorism in the non-test years ahead. The Nation's strongest laser expertise resides at Lawrence Livermore National Laboratory. The administrative structure at Lawrence Livermore already exists there to support this next in a line of six predecessor lasers Given that the NIF will be a national facility available for research from all national laboratories, just as the Nova laser at Livermore is now available, should there be any question about locating the NIF at Livermore?

Secretary O'Leary. Several sites will be considered for the National Ignition Facility (NIF) in the Stockpile Stewardship and Management Programmatic Environmental Impact Statement However, the extraordinary resident expertise in optics and large-laser engineering and operation at Lawrence Livermore National Laboratory makes that laboratory the preferred site at this time.

B-FACTORY

Mr. Fazio. I understand that the B-factory construction at Stanford is on time. I also understand that the President's budget provides sufficient funding to continue the B-factory construction. Please provide an update on the B-factory.

Secretary O'Leary. The project is about 30 percent complete, is on schedule and is proceeding very well. The existing Positron Electron Project (PEP) tunnel has been cleared and refurbished. The original PEP magnets which will be reused in part in both the high energy and low energy ring have all been refurbished. Magnet procurement for the low energy ring is beginning. The klystron development necessary for the RF system is proceeding very well. The most recent prototype klystron is being tested and is expected to prove fully satisfactory.

Appropriations for this project were made in FY 1994 and FY 1995; with the FY 1996 request, appropriations would be 75 percent complete. The final year of appropriations is scheduled to be FY 1997.

Mr. Fazio. What are the benefits to DOE and the scientific community in the short-run and the long-run?

Secretary O'Leary. As executive agent for the U.S. High Energy Physics Program, DOE is responsible for managing a world competitive, cost effective, and forefront research program. A central goal of high energy physics is verification of the so-called "Standard Model" of elementary particles. One of the key issues in determining the scope and validity of the Standard Model is understanding the origins and nature of a phenomena known as charge-parity (CP) violation. This is the phenomenon almost universally accepted as the reason that our known universe is made of matter and not antimatter. One of the best ways to study CP violation is by observation of large numbers of B-mesons. The B-factory at SLAC is specifically designed to produce large numbers of B-mesons (thus its name) and, therefore, is ideally suited to carry out such studies. Because of these capabilities, studying CP violation is one of the principal goals of the B-factory at SLAC, and will extend over many years.

Other research benefits include broad studies of the bottom and charm quarks and antiquarks, the tau lepton (also one of the basic building blocks of matter), and two-photon interactions. All of these studies require a very large number of events, and a very low number of unwanted "background" events. The SLAC B-factory, which is a very high current electron-positron collider, is designed to optimally study these phenomena. There is also the very likely occurrence of entirely new physics phenomenon not anticipated nor even seen before. This is one of the most exciting and profitable aspects of basic research and frequently accompanies the turn-on of new machines.

Mr. Fazio. Please describe for the record what procedures and systems have you put in place to make sure that construction of the B-factory stays (a) on time and (b) on or under budget?

Secretary O'Leary. The construction of the B-factory is a joint collaboration of three laboratories, Stanford Linear Accelerator Center (SLAC), Lawrence Berkeley Laboratory (LBL), and Lawrence Livermore National Laboratory (LLNL), led by SLAC. The Department of Energy, working with the B-factory management team, has put into place a detailed management plan that specifies management structure, relations, and responsibilities for B-factory construction. The working relations between SLAC and LBL and SLAC and LLNL are established by formal memoranda of understanding which are updated semiannually to keep abreast of the changing needs of the work. In addition, a formal Project Management Control System (PMCS), based on the Primavera/Cobra commercial software, has been put in place and validated by an independent review team as being fully functional as a cost, schedule and management tool for the B-factory project.

Construction progress is monitored by a dedicated on-site DOE management team lead by an experienced project manager with an extensive engineering background and through semiannual technical, cost, schedule and management reviews. Each of these reviews is chaired by DOE and includes specialists on all aspects of project design, construction and management. A particular feature of the semiannual reviews is the use of highly qualified consultants (not DOE staff) who are experienced in the science, technology and construction of other, similar colliding beam facilities for high energy physics.

OIL IMPORTS

Mr. Fazio. Secretary O'Leary, last year you told this committee that the United States depends on foreign oil for close to fifty percent our National energy supply. You also stated that you would expect American dependence on foreign oil to continue to climb if prices stay low. The current wourld oil markets are relatively calm. We have not experienced any steep increases in oil prices. Approximately what percentage of America's energy supply today depends on imported oil?

Secretary O'Leary. In 1993, the last year for which complete data are available, U.S. net imports of crude oil and petroleum products were 16.4 quadrillion Btu (quads). Total consumption of energy that year was 83.9 quads. Thus, the percentage of energy consumption met by net imports of crude oil and petroleum products was 19.5 percent. From January through November of 1994, the percentage was slightly higher, at 20.3 percent. In terms of the percentage of petroleum consumption only, net imports represented 44.2 percent in 1993, and 45.2 percent in 1994. These numbers differ from some others that are discussed, because the Energy Information Administration (EIA) calculated net imports. For example, cases where domestic crude oil is exported to an offshore refinery and then brought back to the United States would not add to net exports in the EIA numbers.

OIL IMPORTS

Mr Fazio. What major initiatives have DOE undertaken to bring more stability to our energy supply?

Secretary O'Leary. We operate in a world oil market with a high degree of price uncertainty and volatility. While oil prices are clearly beyond our control, there are cost effective policies that we are pursuing to reduce oil imports and bring stability to our energy supply. Our policies are aimed at strengthening the U.S. economy, by maximizing the economic supply of domestic oil and gas and reducing the demand for oil imports through cost-effective encouragement of conservation, efficiency and fuel switching.

We are taking measurable steps to promote greater domestic production of energy resources -- actions that will enhance America's domestic competitiveness and provide encouragement to the domestic energy industry.

We have aligned our budgetary priorities with essential national goals: satisfying the nation's energy needs, reducing our vulnerability to oil shocks, protecting the environment, and improving the economy.

The commitment to those priorities is reflected in the Administration's FY 1996 budget and represents the best use of taxpayer dollars. We have shifted money from less-effective programs in order to enhance energy efficiency and drive renewable technologies into the marketplace, while also advancing the cause of natural gas, oil and coal.

One of the initiatives proposed by the Administration that will help domestic producers is the export of Alaska North Slope crude oil. The DOE evaluated this issue thoroughly during the last year and found removal of the export ban likely to create additional employment, raise royalty collection for the Federal government and revenues for the States of Alaska and California, and lift domestic production by roughly 100,000 barrels per day.

We are increasing our investment in energy efficiency because new and emerging energy efficiency technologies increase the productivity and competitiveness of our businesses, prevent pollution and reduce other environmental damages, create new U.S. industries and jobs, and help reduce oil imports. The Department operates a balanced portfolio of energy efficiency programs designed to create and commercialize new efficiency technologies in the buildings, utilities and industrial sectors. The 13 percent increase in the Department's energy efficiency budget request for FY 1996 will mean $20 billion in benefits over the next five years and will enable the Administration to carry through on its commitment to a stronger economy, a cleaner environment, and a more secure future.

The Administration places particular emphasis on changing transportation energy patterns because oil accounts for 97 percent of transportation's total energy use. We must develop vehicles with radically improved fuel economy and we must develop and use cost-competitive, domestic and clean transportation fuels. In FY 1996, the Federal government will fund partnerships with private industry, partnerships which have been structured to accelerate these developments.

The Administration has doubled its investment with American industry since 1992 in advanced technologies for the exploration and production of natural gas and oil. New technology significantly decreased the domestic finding and production costs for natural gas and oil and maintains and expands the domestic resource base. The oil programs will contribute toward increasing the recovery of the discovered resource by 4 to 7 billion barrels and increased production by 600,000 to 900,000 barrels per day in 2010. Through the natural gas supply R&D program, we will work with industry to lower exploration and production costs $290 million per year and contribute toward adding up to 2 trillion cubic feet per year of new gas production by the year 2010.

The United States has an abundance of renewable energy resources that can, over time, help reduce our dependence on imported oil. During the last 15 years, intensive work by industry and the Department of Energy's national laboratories has steadily increased the reliability of renewable energy systems while dramatically lowering their costs. These systems are gradually becoming commercially competitive with conventional power sources. Within the next two decades, renewable energy resources can begin reducing our oil imports when used as a substitute for refined products, for powering a growing segment of the U.S. transportation sector, and for heating and cooling our homes and offices.

Today, wind generated electricity is nearly competitive with conventional electric power; the U.S. has regained its lead in world photovoltaic shipments; the geothermal heat pump industry is striving for 12 percent of the U.S. space conditioning market; the bioenergy industry is working to become a major new source of electric power and a major new source of income for America's farmers; and hydrogen energy is being developed as a major energy carrier for the future.

Importantly, the Administration is reducing the red tape and regulations to improve the competitiveness of our domestic natural gas and oil industry.

In addition, to respond to oil supply disruptions, we have an extensive network of agreements with other countries through the International Energy Agency. Coordinated action on stock release policy and demand restraint is much more effective than any one country acting alone. DOE maintains the Strategic Petroleum Reserve and keeps sharp emergency response teams to help the Administration and the Congress manage any sudden energy crisis.

Finally, to reduce the likelihood of price spikes, DOE is trying to boost non-OPEC production around the globe by working with host countries to accept U.S. companies and technologies.

OIL IMPORTS

Mr. Fazio. Which DOE programs offer the greatest long-term potential to rid the United States of our dependence on foreign oil?

Secretary O'Leary. Our plan to lessen our dependence upon imported oil includes increasing investment in energy efficiency, transportation vehicles and alternative fuels, technology, natural gas utilization, and renewables.

The most important DOE programs focus on increasing our investment in transportation vehicles and fuels. The Administration places particular emphasis on changing transportation energy patterns because oil accounts for 97 percent of transportation's total energy use. We must develop vehicles with radically improved fuel economy and we must develop and use cost-competitive, domestic and clean transportation fuels. In FY 1996, the Federal government will fund partnerships with private industry, partnerships which have been structured to accelerate these developments.

An example is the Partnership for a New Generation of Vehicles which being done in conjunction with the Department of Commerce and other agencies. One of its major goals is a mid-size car that has three times the fuel economy (80 miles per gallon) of today's vehicles. We are proposing to increase our budget from $217 million in FY 1994 to $300 million in FY 1996. The projected benefits from these programs are:

- Oil import reductions of 0.2 million barrels per day in 2000 and 2.2 million barrels per day in 2010;
- 68,000 additional jobs in 2000 and 931,000 in 2010;
- Reduced carbon emissions of 6.3 million metric tons in 2000 and 51 million metric tons in 2010; and
- $1.8 billion in savings to vehicle users in 2000, and $25 billion in 2010.

Technology programs also offer the greatest long-term potential to reduce oil dependency. The Administration has doubled its investment with American industry since 1992 in advanced technologies for the exploration and production of natural gas and oil. New technology significantly decreased the domestic finding and production costs for natural gas and oil and maintains and expands the domestic resource base. The oil programs will contribute toward increasing the recovery of the discovered resource by 4 to 7 billion barrels and increased production by 600,000 to 900,000 barrels per day in 2010. Through the natural gas supply R&D program, we will work with industry to lower exploration and production costs $290 million per year and contribute toward adding up to 2 trillion cubic feet per year of new gas production by the year 2010.

While these programs offer the most long-term potential, the Department's investments in efficiency, renewables, and natural gas utilization all will contribute to lessening our dependence upon oil.

DOMESTIC OIL PRODUCTION

Mr. Chapman. As you well know, the United States relies on foreign oil for about one out of every two barrels consumed daily. Can you provide me with your comments on whether, and to what extent, that dependence compromises our national security?

Secretary O'Leary. The Commerce Department recently completed a study of this very question under Section 232 of the Trade Expansion Act. This study concludes that the nation's growing reliance on crude from unstable foreign sources continue to threaten to impair national security by increasing U.S. economic vulnerability to oil supply disruptions. The study recommends that the most beneficial action the Administration could take to improve U.S. energy security is to continue building on our present policies.

The Administration is taking measurable steps to promote greater domestic production of energy resources -- actions that will enhance our competitiveness and provide encouragement to the domestic energy industry. In just the past 30 days, the Administration has taken three steps to reduce the threat to our national security. The Administration has been fighting to maintain the Iraqi export ban which will keep oil prices stable for the near-term; supported the repeal of the export ban on Alaska North Slope crude oil that will help increase domestic production; and issued a proposed rule governing fleet conversions to alternative fuel vehicles that would help reduce dependence on foreign oil. Additional proposals to reduce the costs of domestic production are under review and will be announced in the near future.

Mr. Chapman. What actions need to be taken to reduce our growing reliance on low-priced crude oil from unstable foreign sources?

Secretary O'Leary. Since oil imports are the difference between what we consume and what we produce, both slowing the rise in U.S. oil consumption and arresting the fall in domestic oil production would reduce import demand.

The actions needed to reduce our import demand include increasing investment in energy efficiency, transportation vehicles and alternative fuels, technology, natural gas utilization, domestic oil production, and renewables.

We have aligned our budgetary priorities with essential national goals: satisfying the nation's energy needs, reducing our vulnerability to oil shocks, protecting the environment, and improving the economy.

The commitment to those priorities is reflected in the Administration's FY 1996 budget and represents the best use of taxpayer dollars. We have shifted money from less-effective programs in order to enhance energy efficiency and drive renewable technologies into the marketplace, while also advancing the cause of natural gas, oil and coal.

One of the initiatives proposed by the Administration that will help domestic producers is the export of Alaska North Slope crude oil. The DOE evaluated this issue thoroughly during the last year and found removal of the export ban likely to create additional employment, raise royalty collection for the Federal government and revenues for the States of Alaska and California, and lift domestic production by roughly 100,000 barrels per day.

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Importantly, the Administration is reducing the red tape and regulations to improve the competitiveness of our domestic natural gas and oil industry.

OIL AND GAS INITIATIVES

Mr. Chapman. What actions is the Department currently taking to boost domestic oil production which has been hit hard over the past decade by stagnant energy prices?

Secretary O'Leary. The Department is pursuing many programs and policies to encourage production and to provide opportunities for the domestic industry. We are actively implementing the Domestic Natural Gas and Oil Initiative (DNGOI), which the Department released in December of 1993. This initiative will develop and expand opportunities for jobs in our domestic petroleum industry, while fostering a climate which will increase production from domestic resources, and reduce our reliance on foreign oil. This Initiative has a number of specific actions which will advance and disseminate natural gas and oil technologies, stimulate markets for natural gas, and improve government communication and decision making. Examples of major actions that the Department is working on in 1995 are:

- Advanced Computational Technology Program (ACTI): issue 2nd Call for Proposals for the ACTI Program in June 1995; and expand the Industry Review Panel to include downstream representation. Requesting $48 million for FY 1996 (Action Item 1.1). First Call for Proposals resulted in 31 industry/National Laboratory projects including 149 participants.

- Oil Recovery Class Program: issue the Class IV solicitation for the Oil Recovery Field Demonstration Program in March 1995; award and initiate projects in December 1995. Conduct Class V feasibility study (Action Item 1.3)

- Petroleum Technology Transfer Council (PTTC). support five PTTC regional centers (Action Item 1.5).

- Environmental Technology: initiate field demonstration of Naturally Occurring Radioactive Materials (NORM) and produced water treatment and disposal technologies, and complete analysis of discharges in costal and offshore Gulf of Mexico (Action Item 2.1).

- National Petroleum Council (NPC) Studies: complete the NPC Industry R&D Needs Study in Spring 1995 and incorporate the results in DOE program implementation plans; complete NPC Future of the U.S. Oil and Gas Industry study (Action Item 2.2).

- Gas Delivery: work with the States of Oklahoma and Kansas to adopt the Uniform Production Reporting Model (UPRM) guidelines; assist Kentucky and Texas in their review of UPRM for application to their States (Action Item 3.1).

- Gas Storage and Delivery: working with FERC to expedite certification and construction of natural gas transportation and storage facilities (Action Item 4.3).

- Streamlining Regulations: complete the first phase of the Interstate Oil and Gas Compact Commission study on streamlining regulations for gas and oil exploration and production on Federal lands in California, Colorado, New Mexico, and Wyoming, make decision to proceed with Phase II incorporating additional states if the phase is successful (Action Item 6.1).

- Environmental Regulations: expand assistance to 29 oil and gas producing States to support risk-based regulatory decisionmaking (Action Item 6.2).

- Refining: complete development of the Refinery of the Future initiative, and assist in formulation of alternative compliance strategies for the refining industry as part of EPA's Common Sense Initiative (Action Item 6.3).

- Environmental Regulations: work closely with MMS to develop common sense financial responsibility requirements for offshore facilities to minimize impact of Oil Pollution Act of 1990 on small operators (Action Item 7.5).

- Native Americans: establish a program to assist Native American Tribes with natural gas and oil development (Action Item 8.2).

- Incentives: pursue legislation to lift the ban on export of Alaska North Slope crude oil (Action Item 9.2).

- Incentives: develop revenue-neutral policies for congressional consideration to extend the economic life of marginal wells (Action Item 10.0).

We expect to have other initiatives in the near future. Taken together, these actions will provide significant support to help the domestic industry boost domestic production.

RESEARCH AND DEVELOPMENT

Mr. Chapman. What is the Department's process for setting priorities for research and development for energy programs?

Secretary O'Leary. DOE resource allocation decisions are made on a corporate level through a quality planning-based budget process, one component of the Department's Strategic Management System. The objective of a strategic management approach is to provide a rational basis for relative decision making in what is a very subjective environment with multiple, often competing, goals and objectives. The Department's strategic plan, *Fueling a Competitive Economy*, is the cornerstone for providing a guidepost for allocating resources based on a common understanding of the Departmental mission, priorities, goals and objectives.

The quality planning-based budget process is designed to inform decision makers, analyze issues, and facilitate decision making. The competing R&D investments are analyzed in terms of the expected outcomes and costs relative to the Departmental goals. DOE senior management, acting as a corporate board, recommends investment decisions to the Secretary based on their common understanding of the relative merits of the investments versus all other Departmental resource requirements. Also, this year the process will be enhanced by the results of a task force headed by Daniel Yergin to assess the Department's R&D portfolio from the perspective of industry.

The bottom line is that priorities are determined as objectively as possible based on a common understanding of the mission and the proper role/strategies for achieving the goals set forth in that mission. For example, what is the proper role for DOE in applied research in mature energy industries as opposed to basic research. Together with a common understanding and agreement of the cost/benefits of particular investments through the quality planning-based budget process, a corporate investment strategy is forged that best achieves the DOE goals and objectives, given the fiscal realities.

Mr. Chapman. Does the Department interact with industry in developing these priorities and the individual programs within the research and development programs? If so, can you please expand on how this is accomplished?

Secretary O'Leary. The Department views the private sector as a vital partner in the establishment of funding priorities and ensuring maximum return on Departmental investments. Their involvement is constant and strategic. The private sector invests its money in our research through cost-sharing, mostly with a 50 percent share. This relationship ensures that the Department invests its scarce R&D funds squarely in those areas that will enhance the nation's economic productivity.

In addition, the private sector provides an essential in the continuous evaluation of the relevancy and efficacy of these investments. Currently, we have two large significant initiatives that are aimed to aligning our programs with the private needs and practices. Bob Galvin, and a team of respected industrial leaders, recently completed an in-depth review of our National Laboratories, their missions and their business practices, to advise the Secretary on how to maximize our utilization of these vital resources. Implementing the important findings of this report will dramatically improve the operations of the Labs. Daniel Yergin is heading another private sector-lead team to ensure that our R&D investments are truly aligned with the needs of the nation and responsive to industrial priorities. Dr. Yergin will report his findings to the Secretary in June.

Mr. Chapman. The Galvin Report addressing future missions for DOE National Labs was recently released. Can you provide me with your comments on this report and what your plans are for addressing the task force's recommendations?

Secretary O'Leary. The Department has developed a detailed response, including commitments and deadlines, for 24 of the Galvin Task Force's 29 major recommendations. In addition, we have described why we do not at this time intend to implement the remaining five recommendations. These details are provided in the Department's March 8, 1995, report to the National Science and Technology Council in response to a Presidential Review Directive governing the laboratories of the Department of Energy, Department of Defense and the National Aeronautics and Space Administration. A copy of this report has been provided to the Subcommittee as an attachment to this set of questions.

ALTERNATIVE FUEL VEHICLES

Mr. Chapman. Last week, the House Appropriations Committee approved a rescission package which included $20 million for the purchase of alternative fuel vehicles for the Federal fleet. How will this rescission impact the Department's program on alternative fuel vehicles?

Secretary O'Leary. This rescission recommendation, if implemented, would severely damage our ability to provide Federal leadership on alternative fuels for transportation. This Administration has made alternative fuels a top priority, meeting and exceeding the Congressional requirements for alternative fuel vehicle acquisition. Over the last two years, the Federal alternative fuel vehicle fleet has grown from 3,000 to 17,000 vehicles. We expect to add another 10,000-12,000 in 1995.

Federal leadership on alternative fuels is critical to the successful implementation of the Energy Policy Act of 1992, which lays out a goal of weaning our nation off its dependence on petroleum for transportation. This important Federal role was earlier identified by Congress in the Alternative Motor Fuels Act of 1988 and endorsed by previous administrations. State and local governments, the natural gas industry, electric utilities, and ethanol producers in our farm States are all seeking Federal leadership and commitment on alternative fuels. The auto industry is looking for consistent, committed Federal action in this area so it can make appropriate investments in alternative fuel technologies. With Congressional requirements for State governments and selected private fleets to acquire alternative fuel vehicles starting in 1996, it is more important than ever that the Federal government meet its own statutory requirements to use alternative fuel vehicles.

Specifically, rescission of this funding will result in failure to meet the Energy Policy Act requirement of 10,000 alternative fuel vehicles for Fiscal Year 1995, unless virtually all of the vehicles purchased are methanol flexible-fuel vehicles. In the past we have tried to balance the mix of alcohol and natural gas-powered vehicles. Also harmed will be industry's ability to maintain manufacturing facilities; retain skilled personnel; continue marketing programs; invest in refueling infrastructure; and plan for future products. Loss of fiscal year 1995 funds reduces momentum in the Federal agencies who must gain more experience with alternative fuel vehicles to prepare for the 1996 requirement that 25 percent of all new vehicles must be alternative fuel. By 1999, 75 percent of Federal vehicle purchases will be alternative fuel. If we are to meet these statutory requirements, we must continue the programs that have been established over the last 5 years.

The Department has worked with the Federal agencies over the last 8 months to identify and acquire alternative fuel vehicles. The Department's funds provide a needed supplement for the incremental cost for these vehicles as compared to the conventional gasoline vehicles they replace. Together with funding provided from other agencies, these funds will pay the incremental cost for at least 12,000 alternative fuel vehicles. Most of the Department's 1995 funds are already committed. Funding of $11.6 million has been authorized to specific agencies to cover the incremental cost of about 3,000 vehicles. These vehicles will use methanol, ethanol, and natural gas. New vehicles are provided by Ford, Chrysler, and General Motors, and converted vehicles are provided by small businesses located in several regions of the country. Another $8.3 million is planned for release by April 15, 1995, to acquire an additional 1,600 vehicles for the agencies, at an average in amended cost of about $5,200 per vehicle. Due to the nature of the vehicle procurement acquisition cycle, we believe the majority of these funds will be obligated by the end of fiscal year 1995. To rescind the $20.0 million at this time would directly affect the purchase or conversion of approximately 4,600 alternative fuel vehicles.

Finally, I would like to point out the commitments we have made to State and local governments that would be damaged by this rescission. Over the past year and a half, we have enrolled 34 communities in our Clean Cities program. This program brings together public and private stakeholders to identify and implement specific plans for alternative fuels at the local level. These communities see alternative fuels helping solve local environmental problems while stimulating economic development and utilizing domestic energy sources. Our commitments to them include the placement of Federal alternative fuel vehicles in their community to concentrate vehicles and support infrastructure development. A small Federal investment is thus leveraged with other public and private resources to generate additional support for alternative fuels. A rescission in 1995 would not only disappoint communities expecting Federal alternative fuel vehicles to be placed in their community this year, but would also damage their hopes for the future. We can not afford to do that.

ADVANCED TECHNOLOGIES/ERWM

Mr. Chapman. What is the Department doing to ensure implementation of advanced technologies in the near term in the Environmental Restoration and Waste Management area?

Secretary O'Leary. Environmental Management program managers have been identified for each of the Technology Focus Teams organized around mixed waste, radioactive waste tanks, contaminated plumes, hazardous landfills, and facility decommissioning. These program managers work with the technology developers and the field offices to make sure innovative technologies are implemented at the DOE sites. Analytical teams are organized to track the selection of technologies for implementation.

Mr. Chapman. What additional steps can be taken to further the transfer of more effective technology in the waste site clean-up effort including technologies such as robotics to reduce the threat to the human operator and to make the operation more cost effective and productive?

Secretary O'Leary. Additional steps that could be taken to further the transfer of more effective technologies include the following: ensure that scientists and engineers are involved in the decision process for cleanup and that decisionmakers are aware of and fully evaluate and consider innovative technologies to the maximum extent possible; fully involve regulators and other stakeholders in making decisions at the local level about the technology to be selected; implement an incentive program for implementing the more effective technologies, such as robots, that reduce the threat to the human operator; and identify and eliminate the numerous implementation barriers.

NUCLEAR WASTE FUND

Mr. Chapman. The Department has submitted legislation which would allow the use of revenues from the Nuclear Waste Fund. Can you please describe how this legislation would work?

Secretary O'Leary. The civilian portion of the Radioactive Waste Management Program currently is funded by the beneficiaries of the program through collection of a fee on the commercial generation of nuclear power. Annual appropriations to the program from the Nuclear Waste Fund, however, are considered to be discretionary appropriations subject to the discretionary spending caps established by law. Hence, the program must compete against other programs for a share of the Department's allocation within the Federal Government's discretionary appropriations cap. Under the Department's funding proposal, specific amounts would be made available to the program outside the discretionary spending caps in fiscal years 1996-1998. Assuming the asset sale waiver to Section 257(e) of the Balanced Budget and Emergency Deficit Control Act of 1985 in this bill is enacted, this spending would be offset for budgetary scorekeeping purposes by additional Treasury receipts associated with the sale of the United States Enrichment Corporation. The proposal also includes a provisions that allows the Appropriations Committee to provide limitations and/or direction to the funding of the program.

Mr. Chapman. It is my understanding that the legislation only makes funds available for fiscal year's [sic] 1996, 1997 and 1998. Can you please explain what your funding plans are for the outyears?

Secretary O'Leary. The restructured program and the associated funding profile through fiscal year 2000 were identified in the Civilian Radioactive Waste Management Program Plan which was issued in December 1994. Although the program funding requirements have been identified through the year 2000, the Administration has been able to identify budgetary offsets only for fiscal years 1996 through 1998, related to the sale of the United States Enrichment Corporation. At a future time, depending upon the Congressional action on our proposal, we plan to consider additional budgetary offsets that would fund the program over the remainder of the five-year period.

SUPERCONDUCTING SUPER COLLIDER

Mr. Chapman. What is the status of the Department's negotiations with the State of Texas regarding the termination of the Superconducting Super Collider?

Secretary O'Leary. Negotiations between the Department of Energy and the State of Texas regarding the termination of the Superconducting Super Collider project concluded on November 3, 1994, when the formal Settlement Agreement was signed. The distribution of property contemplated under the Agreement went to closing on December 1, 1994, at which time real and personal property was transferred to Texas along with a settlement payment of $145 million and an escrow payment of $65 million. The escrow amount may be allocated for a proton therapy facility, to be built at the former Superconducting Super Collider site. Texas submitted a formal application for the $65 million payment on December 9, 1994. The Department will make a decision about whether to approve the proposed project by June 1, 1995, following the completion of an environmental analysis. Once the requirement of the National Environmental Policy Act are met and a decision is made, the $65 million will be released from escrow.

The State and DOE continue to perform their respective responsibilities under the Settlement Agreement, which primarily deals with restoration of the surface and subsurface acreage disturbed during the construction of the Superconducting Super Collider.

POSSIBLE SALE OF THE PMAs

Mr. Chapman. The Department's budget request proposes to privatize four of the Power Marketing Administrations (PMAs), including the Southwestern PMA. What will the impact of this proposal be on rural electric cooperatives and their customers?

Secretary O'Leary. By basing the selling price on the discounted net present value of the PMA's financial obligation to the Treasury at the time of the sale, the Administration believes its proposal will cause no rate increases to the cooperatives and their customers.

In the Administration's proposal, the rural electric cooperatives who purchase firm power and other firm power customers of the PMAs, will be given a preferential right of purchase.

EMPLOYMENT FIGURES

Mr. Myers. The full-time equivalent employment figures shown in the fiscal year 1996 Presidential budget appendix for Departmental Administration for fiscal years 1994 and 1995 exceed those which were identified in the fiscal year 1995 budget. Please explain why there are now 82 more FTEs in this account than were requested in the fiscal year 1995 budget.

General Durham. Action on the FY 1995 Budget shifted 46 FTEs from the Energy Supply Research & Development Appropriation to Departmental Administration. The remainder of the increase was primarily workload driven or functional transfers. A detailed table is provided for the record. (The information follows:)

Mr. Myers. How are these salaries being absorbed with existing funds?

General Durham. Action on the fiscal year 1995 budget shifted funding for 46 FTEs from the Energy Supply Research and Development appropriation to Departmental Administration. Employment is below the fiscal year 1995 revised FTE allocation level, thus funding is not an issue.

Departmental Administration FTE Adjustments

Organization	FTE Adjustments	Comments
Office of Policy	25	Congressional action to shift FTEs from Energy Supply to Dept Admin.
Office of Policy	13	Workload driven increase
		International and Export Matters
		National Science & Technology Conference
		Pollution Prevention - Refinery Project
Offiice of Policy	3	Transfer of Space Coordination function from Energy Research
Offiice of Policy	4	Establishment of Moscow Office
Human Resources & Admin	21	Congressional action to shift FTEs from Energy Supply to Dept Admin.
Human Resources & Admin	2	Workload driven increase
Sec of Energy Advisory Board	3	FTEs added as a result of establishment of Office
Ofc of Quality Management	3	FTEs added as a result of establishment of Office
Congress'l & Intergov'l Affairs	1	Legal obligation from EEO judgement
Congress'l & Intergov'l Affairs	1	Support of disabled employee
General Counsel	3	Shift from Economic Regulation to general legal support
General Counsel	1	Hire behind detail to Senate Judicial Committee
Assoc Deputy for Field Mgmt	3	Workload driven increase
Oak Ridge Operations Office	1	Workload driven increase
Chief Financilal Officer	-1	Streamlining Adjustment
Economic Impact & Diversity	-1	Streamlining Adjustment
	82	

OFFICE OF CHIEF FINANCIAL OFFICER

DEPARTMENTAL ADMINISTRATION REALLOCATION OF PRIOR YEAR BALANCES

Mr. Myers. Please provide at the Congressional level of detail a table showing the Departmental Administration account after reallocation of the prior year balances in FY 1995.

Mr. Vivona. The Departmental Administration account has been adjusted to reallot prior year balances in FY 1995 which I would like to provide for the record. This table is representative of what will be provided to you in the March base table. (The information follows:)

DEPARTMENTAL ADMINISTRATION 03/22/95
FY 1995 BASE TABLE LEVEL
(Dollars in thousands)

ADMINISTRATIVE OPERATIONS	FY 1995			FY 1996
	Appropriated	Prior Year Balances	Adjusted	Request
Office of the Secretary	3,416	184	3,600	3,569
General Management				
Personnel Compensation & Benefits	202,886	1,454	204,340	215,129
Other Expenses				
Travel	5,755	642	6,397	6,172
Support Services	178,330	2,265	180,595	176,507
Capital Equipment	6,895	1,594	8,489	7,095
Subtotal, Other Expenses	190,980	4,501	195,481	189,774
Subtotal, General Management	393,866	5,955	399,821	404,903
Program Support				
Policy Analysis & Systems Studies	4,500	294	4,794	5,864
Minority & Economic Impact	3,426	579	4,005	3,415
Consumer Affairs	46	16	62	46
Public Affairs	54	12	66	92
International Policy Studies	0	97	97	
Environmental Policy Studies	6,070		6,070	8,000
Scientific and Technical Training	2,285	1	2,286	2,248
Laboratory Cooperative Science Centers		34	34	
Subtotal, Program Support	16,381	1,032	17,413	19,665
Subtotal, Administrative Operations	413,663	7,171	420,834	428,137
Cost of Work	22,356	45,157	67,513	20,826
SSC			0	
CRADA	2,000		2,000	2,000
Offset 1\			(30,707)	
Subtotal, Cost of Work	24,356	45,157	38,806	22,826
Dept Admin, Obligational Authority	438,019	52,328	459,640	450,963
Offset 2	(30,707)			(11,519)
Dept Admin, Appropriation	407,312			439,444

1\ Reflects use of prior year balances from the Cost of Work for Others Program.

2\ Reflects use of prior year balances from the Cost of Work for Others Program ($11,269), Chief Financial Officer ($196), and Economic Impact and Diversity ($54).

OFFICE OF CHIEF FINANCIAL OFFICER

DEPARTMENTAL ADMINISTRATION ADMINISTRATIVE OPERATIONS

Mr. Myers. Funding for administrative operations increases from $413 million to $428 million in fiscal year 1996. Provide the amount and reason for each incremental increase at the Congressional table level of detail.

Mr. Vivona. Administrative Operations reflects a $14,474,000 increase in FY 1996. The amounts and reasons for these increases are provided at the Congressional table level for the record. (The information follows:)

Office of the Secretary (+$153,000)

The FY 1996 request for the Office of the Secretary reflects an increase in personnel compensation to reflect the full effect of the FY 1995 locality increase and pay raise, the partial year effect of the FY 1996 locality pay increase and pay raise and other base salary adjustments, partially offset by a decrease in travel and support services in accordance with the President's administrative savings initiative, adjusted for inflation.

Personnel Compensation and Benefits (+$12,243,000)

The personnel compensation and benefits increase reflects the full effect of the FY 1995 locality increase and pay raise, the partial year effect of the FY 1996 locality pay increase and pay raise; partially offset by a reduction of two FTEs.

Travel (+$417,000)

With three exceptions, the FY 1996 travel request is in compliance with the President's administrative savings initiative which called for a 9% reduction from FY 1993, adjusted for inflation. The exceptions are increases in the Office of Policy for restoration of environmental policy related travel to the FY 1994 level; the Office of Economic Impact and Diversity to maintain the FY 1994 operating level; and the Chicago Operations Office for improved oversight of DOE facilities. $311,000 of the $417,000 increase was offset by reductions in support services and program support.

Support Services (-$1,823,000)

The FY 1996 support service request is below the President's administrative savings initiative which called for a 9% reduction from FY 1993 (exclusive of rent), adjusted for inflation. The reductions are partially offset by minor increases in the Office of Field Management for development of a Facilities Information Management System (FIMS) which will inventory real property in the DOE complex, and a records management system to house contractor employee case files, infrastructure acquisition, and freedom of information requests (human experimentation); a rent increase at the Oakland Operations Office; and an increase for the Office of Economic Impact and Diversity to maintain the FY 1994 operating level, offset by a reduction in program support.

Policy, Analysis, and System Studies (+1,364,000)

Policy, Analysis, and System Studies increase supports an expanded role in policies regarding national security, strategic planning, DOE program evaluation, and international affairs.

Environmental Policy Studies (+$1,930,000)

Environmental Policy Studies increase maintains the FY 1994 operating level plus 6% which will allow DOE to address impacts of environmental laws, regulations, and issues, as well as technology transfer issues and analysis.

Public Affairs (+$38,000)

Public Affairs increase maintains the FY 1994 operating level which supports the Secretary's commitment to openness and changing DOE focus.

Minority and Economic Impact (-$11,000)

Minority and Economic Impact net funding level offsets the travel and support services increase in the Office of Economic Impact and Diversity which places the office in compliance with the President's administrative savings initiative.

Scientific and Technical Training (-$37,000)

Scientific and Technical Training reduction reflects the President's administrative savings initiative which calls for a 9% reduction from FY 1993, adjusted for inflation. Additional savings were realized in support service reductions.

Capital Equipment (+200,000)

The FY 1996 capital equipment request reflects the FY 1995 level plus inflation.

QUALITY MANAGEMENT

Mr. Myers. Where is the Office of Total Quality Management funded?

General Durham. The Office of Quality Management is funded by the Office of the Assistant Secretary for Human Resources and Administration. Functionally the Office of Quality Management reports directly to the Secretary of Energy.

Mr. Myers. What is the funding level and how many FTEs are in this office in fiscal years 1994, 1995 and 1996?

General Durham. The Office was formed in fiscal year 1994 and was not fully staffed until fiscal year 1995. The funding level for fiscal year 1994 was $2,859,000 and utilized 6 FTEs. In fiscal year 1995, the Office was funded $3,400,000 and staffed with 12 FTEs. Fiscal year 1996 funding will be level with fiscal year 1995 at $3,400,000 and 12 FTEs.

OFFICE OF CHIEF FINANCIAL OFFICER

DEPARTMENTAL ADMINISTRATION OBJECT CLASS

Mr. Myers. Please provide an object class breakdown of all program direction accounts for each headquarters organization and operations, field, area, support or site office in fiscal years 1994, 1995, 1996.

Mr. Vivona. The object class breakdown for each headquarters organization and operations office for fiscal years 1994, 1995, and 1996 is shown in a table which I would like to provide for the record. This table reflects program offices in the Departmental Administration account as they appear in the FY 1996 Congressional Budget. (The information follows:)

DEPARTMENTAL ADMINISTRATION
OBJECT CLASS SUMMARY
FY 1996 CONGRESSIONAL BUDGET REQUEST

OBJECT CLASS	FY 1994 ENACTED	FY 1995 ENACTED	FY 1996 REQUEST
TOTALS			
11.1 Full-Time Permanent Compensation	150,829	157,765	167,008
11.3 Other than full-time permanenet compensation	6,028	7,067	7,926
11.5 Other Compensation	6,893	8,191	8,679
12.1 Civilian Personnel Benefits	31,126	32,912	34,720
21.0 Travel & Transportation of Persons	5,559	6,115	6,531
22.0 Transportation of Things	536	587	616
23.1 Rental Payments to GSA	51,777	42,486	43,164
23.2 Rental Payments to Others	2,737	2,680	2,679
23.3 Communications, Utilities, Misc. Charges	23,946	29,736	29,789
24.0 Printing and Reproduction	4,621	4,377	4,232
25.1 Advisory & Assistance Services	18,662	24,027	27,217
25.2 Other Services	127,893	96,905	93,367
25.3 Purchase of Goods & Services	9,450	9,942	9,941
25.4 Operation of GOCO's	0	0	0
26.0 Supplies & Materials	8,328	8,334	7,999
31.0 Equipment	7,780	6,895	7,095
Use of Prior Year Balances	(54,927)	(30,707)	(11,519)
DEPARTMENTAL ADMINISTRATION, TOTAL	401,238	407,312	439,444

DEPARTMENTAL ADMINISTRATION
OBJECT CLASS SUMMARY
FY 1996 CONGRESSIONAL BUDGET REQUEST

OBJECT CLASS		FY 1994 ENACTED	FY 1995 ENACTED	FY 1996 REQUEST
BOARD OF CONTRACT APPEALS	11.1 Full-time permanent compensation	568	609	636
	11.3 Other than full-time permanent compensation	4	30	32
	11.5 Other personnel compensation	2	11	11
	12.1 Civilian personnel benefits	92	100	105
	21.0 Travel & transport. of persons	6	7	7
	25.2 Other Services	1	1	1
	Use of Prior Year Balances	0	0	0
	TOTAL	673	758	792
CHICAGO	11.1 Full-time permanent compensation	15,621	16,262	17,118
	11.3 Other than full-time permanent compensation	212	260	270
	11.5 Other personnel compensation	449	529	570
	12.1 Civilian personnel benefits	3,004	3,023	3,156
	21.0 Travel & transport. of persons	497	530	625
	22.0 Transportation of things	106	143	86
	23.3 Communications, utilities, misc. charges	1,547	1,492	1,576
	24.0 Printing and reproduction	427	472	486
	25.1 Advisory & Assistance Services	650	128	13
	25.2 Other Services	4,676	5,206	4,760
	26.0 Supplies & Materials	399	761	783
	31.0 Equipment	182	205	211
	Use of Prior Year Balances	0	0	0
	TOTAL	27,870	29,011	29,654
CHIEF FINANCIAL OFFICER	11.1 Full-time permanent compensation	13,539	13,536	14,092
	11.3 Other than full - time permanent comp	175	165	196
	11.5 Other personnel compensation	486	482	504
	12.1 Civilian personnel benefits	2,498	2,437	2,531
	21.0 Travel & transport. of persons	234	234	234
	25.1 Advisory & Assistance Services	4,553	5,122	4,615
	25.2 Other services	2,621	2,354	2,458
	31.0 Equipment	396	352	362
	Use of Prior Year Balances	0	0	(196)
	TOTAL	24,402	24,682	24,796
CONGRESS. & INTERGOV AFF	11.1 Full-time permanent compensation	3,839	3,811	4,118
	11.3 Other than full - time permanent comp	553	669	709
	11.5 Other personnel compensation	126	202	213
	12.1 Civilian personnel benefits	788	788	839
	21.0 Travel & transportation of persons	69	69	69
	25.2 Other Services	5	5	5
	Use of Prior Year Balances	0	0	0
	TOTAL	5,380	5,544	5,953
ECONOMIC IMPACT & DIVERSITY	11.1 Full-time permanent compensation	3,134	3,119	3,387
	11.3 Other than full - time permanent comp	292	240	393
	11.5 Other personnel compensation	111	89	96
	12.1 Civilian personnel benefits	693	564	624
	21.0 Travel & transportation of persons	113	114	130
	25.1 Advisory & Assistance Services	237	200	265
	25.2 Other services	3,654	3,453	3,415
	Use of Prior Year Balances	0	0	(54)
	TOTAL	8,134	7,779	8,256
FIELD MANAGEMENT	11.1 Full-time permanent compensation	6,104	6,420	7,192
	11.3 Other than full-time compensation	31	51	60
	11.5 Other personnel compensation	96	134	147
	12.1 Civilian personnel benefits	1,080	1,111	1,222
	21.0 Travel & transport. of persons	313	320	319
	25.1 Advisory & Assistance Services	6,391	6,372	6,691
	25.2 Other services	359	1,009	945
	31.0 Equipment	20	30	31
	Use of Prior Year Balances	0	0	0
	TOTAL	14,394	15,447	16,607

DEPARTMENTAL ADMINISTRATION
OBJECT CLASS SUMMARY
FY 1996 CONGRESSIONAL BUDGET REQUEST

OBJECT CLASS		FY 1994 ENACTED	FY 1995 ENACTED	FY 1996 REQUEST
GENERAL COUNSEL	11 1 Full-time permanent compensation	10,357	10,937	12,779
	11 3 Other than full - time permanent compensation	404	709	755
	11 5 Other personnel compensation	153	261	296
	12 1 Civilian personnel benefits	1,869	1,922	2,183
	21 0 Travel & transport. of persons	160	170	170
	25.2 Other services	1,382	1,400	1,382
	26.0 Supplies & Materials	260	265	270
	Use of Prior Year Balances	0	0	0
	TOTAL	14,585	15,664	17,835
HUMAN RESOURCES & ADMIN.	11 1 Full-time permanent compensation	44,378	46,168	48,917
	11.3 Other than full-time permanent compensation	1,295	1,229	1,508
	11 5 Other personnel compensation	3,990	4,309	4,651
	12.1 Civilian personnel benefits	11,172	11,901	12,647
	21 0 Travel & transport. of persons	1,946	2,192	2,186
	22.0 Transportation of things	254	242	230
	23.1 Rental payments to GSA	46,501	37,126	38,327
	23.2 Rental payments to others	111	105	100
	23.3 Communications, utilities, misc. charges	16,687	22,426	22,672
	24.0 Printing and reproduction	3,359	3,291	3,132
	25.1 Advisory & Assistance Services	220	209	199
	25.2 Other services	39,902	44,338	42,410
	25.3 Purchase of Goods and Services	9,329	9,818	9,817
	26.0 Supplies & Materials	5,809	5,518	5,241
	31 0 Equipment	6,323	5,341	5,496
	Use of Prior Year Balances	0	0	0
	TOTAL	191,276	194,213	197,533
IDAHO	11 1 Full-time permanent compensation	8,356	8,413	8,762
	11.3 Other than full-time permanent compensation	148	210	232
	11.5 Other personnel compensation	188	269	289
	12.1 Civilian personnel benefits	1,578	1,678	1,737
	21.0 Travel & transport. of persons	442	471	470
	22.0 Transportation of things	100	100	200
	23.2 Rental payments to others	2,545	2,450	2,462
	23.3 Communications, utilities, misc. charges	2,600	2,500	2,336
	24.0 Printing and reproduction	792	570	570
	25.1 Advisory & Assistance Services	500	550	536
	25.2 Other services	5,731	6,204	6,084
	26.0 Supplies & Materials	1,032	660	670
	31.0 Equipment	309	348	358
	Use of Prior Year Balances	0	0	0
	TOTAL	24,321	24,423	24,676

DEPARTMENTAL ADMINISTRATION
OBJECT CLASS SUMMARY
FY 1996 CONGRESSIONAL BUDGET REQUEST

OBJECT CLASS		FY 1994 ENACTED	FY 1995 ENACTED	FY 1996 REQUEST
OAK RIDGE	11.1 Full-time permanent compensation	19,363	20 211	20 836
	11.3 Other than full-time permanent compensation	553	588	636
	11.5 Other personnel compensation	490	623	561
	12.1 Civilian personnel benefits	3,703	3,775	3 891
	21.0 Travel & transport. of persons	403	429	428
	22.0 Transportation of things	66	94	92
	23.1 Rental Payments to GSA	1 785	1,787	1 162
	23.2 Rental payments to others	16	60	62
	23.3 Communications, utilities, misc. charges	1 218	1,423	1 410
	24.0 Printing and reproduction	30	30	30
	25.1 Advisory & Assistance Services	0	0	0
	25.2 Other Services	6 000	6,600	7 072
	26.0 Supplies and materials	433	736	736
	31.0 Equipment	456	514	529
	Use of Prior Year Balances	0	0	0
	TOTAL	34,516	36,789	37,434
OFFICE OF THE SECRETARY	11.1 Full-time permanent compensation	1,317	1,084	1 154
	11.3 Other than full-time permanent compensation	604	1 193	1,261
	11.5 Other personnel compensation	136	249	254
	12.1 Civilian personnel benefits	350	513	536
	21.0 Travel & transport. of persons	242	380	359
	25.2 Other Services	7	7	6
	Use of Prior Year Balances	0	0	0
	TOTAL	2,656	3,416	3,569
OFFICE OF POLICY	11.1 Full-time permanent compensation	8,875	11,233	11,532
	11.3 Other than full-time permanent compensation	948	1,050	1,213
	11.5 Other personnel compensation	180	596	530
	12.1 Civilian personnel benefits	1,746	2.183	2,240
	21.0 Travel & transport. of persons	620	671	785
	25.1 Advisory & Assistance Services	5,589	10,570	13,864
	25.2 Other services	1,017	935	889
	Use of Prior Year Balances	0	0	0
	TOTAL	18,975	27,238	31,053
PUBLIC & CONSUMER AFFAIRS	11.1 Full-time permanent compensation	2,719	2,898	3,091
	11.3 Other than full-time permanent compensation	277	295	315
	11.5 Other personnel compensation	119	150	157
	12.1 Civilian personnel benefits	544	553	584
	21.0 Travel & transport. of persons	91	97	97
	25.1 Advisory & Assistance Services	102	100	138
	25.2 Other services	4	4	4
	Use of Prior Year Balances	0	0	0
	TOTAL	3,856	4,097	4,386

DEPARTMENTAL ADMINISTRATION
OBJECT CLASS SUMMARY
FY 1996 CONGRESSIONAL BUDGET REQUEST

OBJECT CLASS		FY 1994 ENACTED	FY 1995 ENACTED	FY 1996 REQUEST
OAKLAND	11.1 Full time permanent compensation	12,729	13,056	13,394
	11.3 Other than full-time permanent compensation	332	378	348
	11.5 Other personnel compensation	367	387	418
	12.1 Civilian personnel benefits	2,119	2,364	2,426
	21.0 Travel & transport. of persons	423	451	450
	22.0 Transportation of things	10	8	8
	23.1 Rental payments to GSA	3,491	3,571	3,675
	23.2 Rental payments to others	65	65	65
	23.3 Communications, utilities, misc. charges	1,894	1,895	1,795
	24.0 Printing and reproduction	13	14	14
	25.1 Advisory & Assistance Services	420	776	896
	25.2 Other services	828	1,033	1,120
	25.3 Purchase of goods & services from govt. acct.	121	124	124
	26.0 Supplies & materials	395	395	300
	31.0 Equipment	94	105	108
	Use of Prior Year Balances	0	0	0
	TOTAL	23,301	24,622	25,141
WORK FOR OTHERS (COSTS)	25.2 Other services	61,626	24,356	22,826
	Use of Prior Year Balances	(54,927)	(30,707)	(11,269)

OFFICE OF CHIEF FINANCIAL OFFICER

DEPARTMENTAL ADMINISTRATION SUPPORT SERVICE CONTRACTS

Mr. Myers. For each headquarters organization and field organization, provide a list of all support service contracts including the cost of the contract and which program activity funds it, the associated full time employees, and the purpose for each contract. For each support service contract, provide the average cost per employee.

Mr. Vivona. Support service contracts as recorded in the Procurement and Acquisition Data System are provided for the record (the information follows:)

SUPPORT SERVICE CONTRACTS
DEPARTMENTAL ADMINISTRATION

Program Office	Contract Name	FY 95 Funding	FY 96 Funding	95 Assoc FTE Emps	96 Assoc FTE Emps	95 Avg Cost/ Employee	96 Avg Cost/ Employee	Purpose
Policy	Environ Mgmt & Resources	300,000	300,000	5.00	5.00	60,000	60,000	Correspondence control
	Sociotechnical Research App	600,000	800,000	8.00	9.00	88,000	88,000	DOE: performance measurement
	Subtotal	900,000	1,100,000	13	14			
Chief Financial Officer	Brown & Company	664,000	627,000	6.60	6.70	101,520	99,640	Auditing & analysis
	Envirn Mgmt & Res Inc	190,000	179,000	3.25	3.00	58,462	59,667	Info mgmt & document production
	Subtotal	854,000	806,000	9.85	9.70			
Human Resources	Chas H Thompkins Inc	439,000	425,800	3.00	3.00	75,000	75,000	Elevator Maintenance
	Hagerstown Goodwill Industries	337,000	326,900	10.00	10.00	17,000	17,000	Floor cleaning & trash pickup GTN facility
	Internet Systems Inc	3,024,000	2,933,300	44.00	40.00	28,600	28,600	Library services
	LAM Assoc Inc	753,000	730,400	25.00	24.00	27,000	27,000	Courier & messenger
	LAM Assoc Inc	465,000	451,100	15.00	15.00	31,000	31,000	Self Service Supply Store
	LAM Assoc Inc	996,000	966,100	30.00	29.00	30,000	30,000	Labor & moving services
	LAM Assoc Inc	220,000	213,400	5.00	5.00	27,000	27,000	Photography
	Logistics Application Systems	707,000	685,800	29.00	28.00	24,000	24,000	Database service
	Logistics Application Systems	452,000	438,400	15.00	15.00	30,000	30,000	Landover Warehouse
	Melwood Horticultural	215,000	208,600	10.00	10.00	22,000	22,000	Grounds maintenance
	Meta Inc	728,000	706,100	20.00	19.00	50,000	50,000	Conferencing & Audio Visual support
	Research Mgmt Consultants Inc	485,000	470,500	8.00	8.00	60,500	60,500	Energy Technologies Visuals Collection
	Soc Enterprises	288,000	279,400	13.00	13.00	15,500	15,500	Photocopy & Distribution
	Supreme Limousine Service Inc	250,000	242,500	2.00	2.00	24,000	24,000	Shuttle bus
	Tri-Ark Industries Inc	1,430,000	1,387,100	46.00	44.00	26,000	26,000	Cleaning services
	Wilkins Systems Inc	165,000	160,100	18.00	17.00	14,000	14,000	Copy centers
	Logistics Application Systems	337,000	326,900	9.00	9.00	42,000	42,000	Contract close-out
	MacFadden & Assoc	800,000	776,000	11.00	11.00	73,000	73,000	ADP support
	LAM Assoc Inc	268,500	260,400	7.50	7.50	33,500	33,500	Operate bid center; preparation of contract documents
	LAM Assoc Inc	417,600	405,100	9.50	9.50	42,000	42,000	ADP support
	Wyatt Data Services	200,000	194,000	2.50	2.50	67,000	67,000	Compensation survey
	Comprehensive Tech Intl Inc	1,257,000	0	22.00	0.00	57,000	0	ADP support
	Computer Data Systems Inc	11,400,000	0	150.00	0.00	59,000	0	ADP support
	Dyncorp	15,960,000	25,084,200	210.00	325.00	59,000	59,000	ADP support
	Signal Corp	1,034,000	1,719,400	19.00	32.00	54,000	54,000	Data Entry support
	SOZA	56,800	94,500	2.00	3.00	29,000	29,000	ADP support
	Ingenium Corp	81,000	0	0.50	1.00	132,000	0	Culture survey analysis
	Booz Allen & Hamilton Inc	1,332,000	373,500	8.40	2.00	143,000	143,000	Management studies
	Legacy management Assoc	150,500	146,000	1.00	1.00	60,000	60,000	Training seminars
	MACRO International Inc	21,600	0	0.10	0.00	147,000	0	Customer survey analysis
	Vista Technology Inc	1,350,000	1,309,500	9.00	9.00	144,000	144,000	Training programs
	Subtotal	45,620,000	41,315,000	754.50	694.50			
General Counsel	Various Patent Attorneys	174,000	180,000	460.00	460.00	75,652	78,260	DOE: patent processing
Economic Impact and Diversity	Various Investigators	220,000	220,000	20.00	20.00	11,000	11,000	EEO investigations
Field Management	ARINC	300,000	195,000	2.50	1.50	120,000	123,600	Nuclear weapons material & remediation cost est
	Burns & Roe	670,000	840,000	6.50	6.00	103,077	103,077	Environmental restoration cost & schedule estimates

SUPPORT SERVICE CONTRACTS
DEPARTMENTAL ADMINISTRATION

Program Office	Contract Name	FY 95 Funding	FY 96 Funding	95 Assoc FTE Emps	96 Assoc FTE Emps	95 Avg Cost/ Employee	96 Avg Cost/ Employee	Purpose
	Exeter	550,000	550,000	5.50	5.50	100,000	103,000	Utility rate intervention & negotiation
	Foster Wheeler 16	670,000	810,000	6.50	6.00	103,077	106,169	Major systems acquisition independent cost estimate
	Foster Wheeler 17	655,000	850,000	6.50	6.00	100,769	103,792	Major environmental facilities construction & life cycle cost est
	MTM	100,000	0	1.00	0.00	100,000	0	Program management & control system data systems
	GSC	600,000	550,000	5.00	4.50	120,000	123,600	Cost estimating software tools set development & maintenance
	JIL	600,000	700,000	5.00	5.50	120,000	123,600	Cost estimating relationship modeling
	RMCI	804,000	804,000	8.50	8.50	94,588	94,588	Facilities maintenance analysis & life cycle planning
	PEI	125,000	0	1.00	0.00	125,000	0	Cost database development and maintenance
	Syntech	473,720	428,000	3.00	2.50	157,907	162,644	Program control system analysis & support
	Subtotal	5,547,720	5,727,000	51.00	46.00			
Chicago Operations Office	Strategic Business Services	109,167	109,167	1.50	1.50	72,778	72,778	Administrative contractual closeout of purchase orders
	Ralph G. Moore Associates	2,232,000	2,198,000	34.30	32.05	65,075	68,576	ADP support
	MAC Technical Services	150,000	100,000	1.34	0.89	112,178	112,178	Program & project technical assistance
	Various Patent Attorneys		45,000		1.30		23,000	Patent preparation
	Subtotal	2,491,167	2,452,167	37.14	35.74			
Idaho Operations Office	Dylantic Inc	250,000	300,000	10.00	11.50	25,000	26,000	Secretarial support
	ISU	10,000	10,175	0.11	0.11	90,000	92,500	Administrative consulting
	M&L Technologies	87,250	0	0.00	0.00	0	0	Software license
	Scientech Inc	100,000	100,000	1.00	1.00	100,000	100,000	Technical support
	Cascade Centers Inc	50,000	52,000	0.45	0.45	110,000	115,000	Employee assistance program
	Subtotal	497,250	462,175	11.56	13.06			
Oak Ridge Operations Office	PAI Corp	18,000	0	0.20	0.00	55,000	0	Grant management system implementation
	Tresp Associates	1,460	1,500	30.00	30.00	49,000	49,000	ADP/telecommunications support
	Systematic Management Services	150,000	690,000	6.00	6.00	115,000	115,000	ES&H & quality assurance technical assitance
	Estes Petroleum Equipment, Inc	85,000	0	0.20	0.00	53,000	0	Removal of underground storage tanks
	East Tennessee Mechanical Co	162,000	166,000	1.50	1.50	67,000	67,000	Miscellaneous repairs/renovations to buildings
	Analysas Corp.	1,692,000	1,742,000	44.00	44.00	38,500	38,500	Administrative/clerical support
	Diversified Services Associates	40,000	40,000	1.00	1.00	28,000	28,000	Grounds maintenance
	GS Tech, Inc	350,000	470,000	12.00	12.00	39,000	39,000	Facilities support for DOE/ORO buildings
	Johnson Controls	214,000	220,000	13.00	13.00	16,500	16,500	Maintenance of vehicles & space services for Federal building
	Klean-Rite Services, Inc	500,000	515,000	14.80	14.80	26,000	26,000	Janitorial services for DOE/ORO buildings
	Montgomery Elevator Co	25,000	25,000	0.10	0.10	65,000	65,000	Elevator maintenance
	Subtotal	3,237,460	3,869,500	123	122			
Oakland Operations Office	Aguire International	197,000	230,000	6.00	6.00	32,830	38,330	Data entry
	Crescent Investigations	400,000	575,000	9.00	9.00	44,440	63,890	Guard services
	Execter Associates	324,000	325,000	1.69	1.69	191,720	192,310	Utilities/engineering support
	Lee Associates	255,000	300,000	10.00	10.00	25,500	30,000	Mail & records management
	Tresp Associates	726,000	730,000	20.50	20.50	35,410	35,610	ADP/communications support
	Williams Adley & Co	100,000	100,000	3.00	3.00	33,330	33,330	Contract closeout support
	Track Computer Center	30,000	30,000	0.50	0.50	15,000	15,000	Computer maintenance (labor/parts)

SUPPORT SERVICE CONTRACTS
DEPARTMENTAL ADMINISTRATION

Program Office	Contract Name	FY 95 Funding	FY 96 Funding	95 Assoc FTE Emps	96 Assoc FTE Emps	95 Avg Cost/ Employee	96 Avg Cost/ Employee	Purpose
	Various Patent Attorneys	45,000	50,000	1.33	1.33	40,000	40,000	Patent preparation
	Subtotal	2,077,000	2,340,000	52.02	52.02			
Total, Depart Admin		61,618,597	58,471,842	1,532	1,467			

Notes:

- Contract source: Procurement & Acquisition Data System (PADS)
- Human Resource funding includes ADP support for all Departmental Administration funded programs
- FY 1995 funding excludes use of uncosted balances in some cases, or may reflect awards late in the fiscal year

OFFICE OF CHIEF FINANCIAL OFFICER

DEPARTMENTAL ADMINISTRATION UNCOSTED BALANCES

Mr. Myers. Please provide the Department's annual report on uncosted balances.

Mr. Vivona. The Department's FY 1994 annual Report on Uncosted Balances is being finalized at the present time. We expect that this report will be available by the end of this month. We will be pleased to forward a copy to you as soon as it is available.

OFFICE OF CHIEF FINANCIAL OFFICER
DEPARTMENTAL ADMINISTRATION
REIMBURSABLE WORK FOR OTHER FEDERAL AGENCIES

Mr. Myers. The Department provides specialized services to other federal agencies through the reimbursable work for others program. What is the dollar level involved with these reimbursable activities in fiscal year 1994, 1995 and estimated for 1996? Please describe the nature of the work involved and the other agencies requesting the work.

Mr. Vivona. The dollar level involved with federal reimbursable activities for FY 1994, FY 1995, and FY 1996 is shown in a table which I would like to insert in the record. The information follows:

REIMBURSABLE WORK FOR OTHER FEDERAL AGENCIES
(obligations in thousands of dollars)

	FY 1994	FY 1995	FY 1996
Department of Defense	$967,570	$1,231,890	$1,180,832
United States Enrichment Corporation	669,253	672,134	704,314
Nuclear Regulatory Commission	105,210	106,592	105,868
National Aeronautics & Space Admin	53,742	50,754	37,915
Department of State	40,616	114,525	114,650
Health and Human Services	45,253	35,929	36,003
Department of Transportation	25,823	38,000	43,011
Environmental Protection Agency	20,614	14,075	16,024
Other Federal Agencies	45,968	89,264	94,749
	$1,974,049	$2,353,163	$2,333,366

The Department of Energy conducts a wide variety of reimbursable activities with other federal agencies which provide valuable opportunities for technology development and scientific excellence in support of DOE programmatic missions. Major reimbursable activities include: (1) logistical support of the Nevada Test Site, the assembly of weapons parts, and research and development for aerospace systems, exploratory military systems, safeguards and security, etc., for the Department of Defense; (2) power and other costs related to operation of the gaseous diffusion plants for the United States Enrichment Corporation; (3) technical assistance to the newly independent states (former Soviet Union) in the upgrading of safety standards of nuclear reactors located in the Ukraine and Russia for the State Department's Agency for International Development; and (4) reactor safety research and support activities for the Nuclear Regulatory Commission.

OFFICE OF THE CHIEF FINANCIAL OFFICER
PAYMENTS IN LIEU OF TAXES

Mr. Myers. Describe by state all cases where the Department makes payments in lieu of taxes. What is the Department's policy on this program? What is the magnitude of future program costs?

Mr. Vivona. The following local taxing jurisdictions are currently receiving annual payments:

Illinois	DuPage County
Pennsylvania	Allegheny County Borough of West Mifflin West Mifflin School District
New Jersey	Township of Wayne
New York	McCracken School District Town of Lewiston Lewiston-Porter School District Niagara County
California	Livermore Valley Joint Unified School District
Ohio	Pike County
South Carolina	Aiken County Allendale County Barnwell County

The following jurisdictions in Tennessee received a previous payment covering all payments in lieu of taxes until 1995. All may reapply for payments commencing in 1996: Roane County, Anderson County and the City of Oak Ridge.

The following jurisdictions have been approved for payment, contingent on availability of funds:

Ohio	Hamilton County Montgomery County
Washington	Franklin County Grant County

The following jurisdiction in Washington has submitted an application for payment that is currently under Headquarters review: Benton County.

Other counties and local governments are in various stages of the application process, but final applications have not been received for review by Headquarters.

The current Departmental policy is represented in Secretarial guidance issued in September of 1993. That guidance allows payments to be made to eligible jurisdictions, based upon a property's zoning classification when first acquired by the Federal government To be eligible, a jurisdiction must have taxing authority over an area containing a property owned by the Department of Energy and used under authority of the Atomic Energy Act of 1954, as amended.

The amount of the payment is based upon the value of the property, if that property were still in the condition in which the Federal government acquired it. Local property tax rates are then applied to get the amount of the payment.

Department is currently in the process of developing a proposed rule covering payments in lieu of taxes to ensure that all eligible communities are treated equitably.

Future costs of this program are extremely difficult to estimate. They depend on:

1) Local real estate market conditions in each of the host communities.
2) Local property tax rates in each of the host communities.
3) The future amount of land owned by the Department and used for Atomic Energy Act purposes.

Currently, the Department estimates that, if all eligible communities applied and were approved for payment the costs would range from $10-20 million annually.

HUMAN RESOURCES AND ADMINISTRATION
SUBSIDY FOR ENERGY EMPLOYEES TRANSIT PROGRAM

Mr. Myers. What were the Department's total costs and costs per employee in fiscal years 1993, 1994, 1995, and 1996 for the Subsidy for Energy Employees Transit program?

General Durham. The total Departmental costs for the Subsidy for Energy Employees Transit program for fiscal years 1993, 1994, 1995 and 1996 are:

FY 1993:	$481,000	
FY 1994:	$465,000	
FY 1995:	$195,000 to date	$468,000 projected
FY 1996:	$460,000 projected	

The cost per employee has remained at $21.00 per month since the program's inception in 1992.

Mr. Myers. How many employees participate?

General Durham. There are currently 2,400 eligible participants in the program. Monthly participation in the program varies, with an average of 1,900 employees participating each month.

HUMAN RESOURCES AND ADMINISTRATION
DEPARTMENTAL ADMINISTRATION STAFFING

Mr. Myers. By organization, how many FTEs are funded in Departmental Administration in fiscal years 1992, 1993, 1994, 1995 and 1996?

General Durham. The table shows actual and requested levels of FTEs for Departmental Administration for those fiscal years. (The information follows:)

03/22/95

DEPARTMENTAL ADMININSTRATION STAFFING
(FULL-TIME EQUIVALENTS)

ORGANIZATION	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996
Human Resources & Admininstration	1,032	983	966	939	920
Arms Control & Nonproliferation	9				
Office of Hearings and Appeals	7	7	6	8	8
Congress'l & Intergovern'l Affairs	70	64	65	68	72
Chief Financial Officer	249	284	290	279	277
Econmic Impact and Diversity	22	59	59	57	60
Assoc Deputy for Field Management		82	88	95	105
General Counsel	160	153	153	158	181
Contractor Employee Relations	1				
Public Affairs	45	54	56	54	55
Policy	166	155	161	151	195
Quality Management					12
Office of the Secretary	37	29	29	30	30
Secretary of Energy Advisory Board					9
Scheduling and Logistics	8				
Special Projects	15	14			
Chicago Operations Office	291	325	329	319	318
Idaho Operations Office	210	196	172	168	168
Oak Ridge Operations Office	430	425	414	407	404
Oakland Operations Office	242	256	246	254	253
	2,994	**3,086**	**3,034**	**2,987**	**3,067**

HUMAN RESOURCES AND ADMINISTRATION
PERSONNEL STRENGTHS

Mr. Myers. Provide for the record a table showing fiscal year 1994 yearend and fiscal years 1995 and 1996 planned yearend personnel strengths for each Departmental Organization, including all operations, field , area, support and site offices, each laboratory and other GOCO activities.

General Durham. The following tables show actual and planned yearend personnel strengths for the requested years. (The information follows:)

03/22/95 DEPARTMENT OF ENERGY - YEAREND EMPLOYMENT

ORGANIZATION	ACTUAL FY 1994	PLANNED FY 1995	PLANNED FY 1996
Office of the Secretary	32	30	30
Sec Energy Advisory Board		8	8
Chief Financial Officer	295	290	275
Congressional & Intergovernmental Aff	73	73	70
Defense Programs	420	350	330
Economic Impact and Diversity	58	58	55
Energy Efficiency & Renewable Energy	626	620	615
Environment, Safety & Health	465	460	480
Energy Information Administration	477	475	475
Environmental Management	687	750	800
Energy Research	365	360	350
Science Education & Technical Informa	192	192	175
Fossil Energy	233	230	220
Assoc Director for Field Management	92	95	100
General Counsel	217	220	210
Hearings & Appeals	90	85	80
Human Resources & Administration	1,000	930	900
Inspector General	345	345	345
Fissile Material Disposition		20	30
Nonproliferation and National Security	358	355	350
Nuclear Energy	236	230	210
Policy	234	230	220
Public & Consumer Affairs	58	56	50
Quality Management	10	12	10
Civilian Radioactive Waste	227	225	230
DUS for Tech Partnerships		18	15
Worker and Community Transition		18	15
Federal Energy Regulatory Commission	1,415	1,430	1,425
HEADQUARTERS	8,205	8,165	8,073
Albuquerque Operations Office	1,562	1,580	1,550
Chicago Operations Office	600	600	600
Idaho Operations Office	487	470	460
Nevada Operations Office	402	410	400
Oakland Operations Office	416	430	440
Oak Ridge Operations Office	730	750	745
Richland Operations Office	473	550	580
Savannah River Operations Office	563	590	600
OPERATIONS OFFICES	5,233	5,380	5,375
Bartlesville Project Office	26	27	25
Morgantown Energy Technology Cente	338	330	300
Pittsburgh Energy Technology Center	316	310	300
ENERGY TECH CENTERS	680	667	625

03/22/95 DEPARTMENT OF ENERGY - YEAREND EMPLOYMENT

ORGANIZATION	ACTUAL FY 1994	PLANNED FY 1995	PLANNED FY 1996
Casper Naval Petroleum Reserve	14	14	10
Elk Hills Naval Petroleum Reserve	54	51	40
Golden Field Office	44	44	40
Ohio Field Office	123	230	240
Rocky Flats Office	233	280	300
Pittsburgh Naval Reactors	80	80	75
Schenectady Naval Reactors	68	70	65
Strategic Petroleum Reserve PMO	125	130	120
SPECIAL PURPOSE OFFICES	741	899	890
Alaska Power Admin	32	31	30
Bonneville Power Admin	3,562	3,500	3,320
Southeastern Power Admin	44	44	40
Southwestern Power Admin	214	205	190
Western Area Power Admin	1,502	1,500	1,455
POWER ADMINISTRATIONS	5,354	5,280	5,035
DEPARTMENT TOTAL	20,213	20,391	19,998

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03/22/95 DEPARTMENT OF ENERGY - CONTRACTOR EMPLOYMENT

DOE OPERATIONS OFFICE/ CONTRACTORS	ADDITIONAL INFO	CITY	STATE	PRGM	9/30/94 * ONBOARD
M&O CONTRACTORS					
ALBUQUERQUE OPERATIONS OFFICE					
ALLIED CORP	BENDIX KANSAS CITY DIV	KANSAS CITY	MO	DP	3,289
LOVELACE MED FDN	BIO & ENV RES INST	ALBUQUERQUE	NM	ER	168
MARTIN MARIETTA	MMSC-PINELLAS PLANT	CLEARWATER	FL	DP	999
MASON & HANGER-SILAS	PANTEX PLANT	AMARILLO	TX	DP	2,853
MMES-SANDIA CORP	SANDIA NATL LAB	ALBUQUERQUE	NM	DP	8,458
ROSS AVIATION INC		ALBUQUERQUE	NM	DP	135
UNIV OF CALIFORNIA	LOS ALAMOS NATL LAB	LOS ALAMOS	NM	DP	7,024
WESTINGHOUSE	WIPP	CARLSBAD	NM	DP	735
					23,661
CHICAGO OPERATIONS OFFICE					
ASSOCIATED UNIV	BROOKHAVEN NATL LAB	UPTON	NY	ER	3,083
IOWA STATE UNIV	AMES RESEARCH LAB	AMES	IA	ER	538
MIDWEST RES INST	NATL RENEW ENERGY LAB	GOLDEN	CO	CE	913
PRINCETON UNIV	PPPL	PRINCETON	NJ	ER	729
UNIV OF CHICAGO	ARGONNE NATL LAB	ARGONNE	IL	ER	3,644
UNIV OF CHICAGO	ANL REACTOR FACILITIES	IDAHO FALLS	ID	ER	858
UNIV RESEARCH ASSN	FERMILAB	BATAVIA	IL	ER	2,168
					11,933
HEADQUARTERS OFFICE (RW)					
TRW (INC)	TESS	FAIRFAX	VA	RW	567
					567
IDAHO OPERATIONS OFFICE					
BABCOCK & WILCOX ID	INEL SMC PROJECT	IDAHO FALLS	ID	NE	355
EG&G IDAHO INC	IDAHO NATL ENGRG LAB	IDAHO FALLS	ID	NE	4,827
MK FERGUSON ID CO	CONST MGMT INEL	IDAHO FALLS	ID	NE	149
PRO TECH IDAHO INC	PTI INEL SECURITY	IDAHO FALLS	ID	NE	326
WESTINGHOUSE	W VALLEY NUCL SEV CO	WEST VALLEY	NY	EM	
WESTINGHOUSE IDAHO	IDAHO NATL ENGRG LAB	IDAHO FALLS	ID	NE	1,759
					7,416
NAVAL PETROLEUM RESERVES OFFICE					
BECHTEL	NAVAL PETR RESRVE CA	ELK HILLS	CA	FE	733
FLOUR DANIEL	F D SERVICE INC/NPR3	CASPER	WY	FE	127
					860
NEVADA OPERATIONS OFFICE					
EG&G INC	LAS VEGAS OPNS	LAS VEGAS	NV	DP	1,829
RAYTHEON SVS NEVADA	ENERGY SUPPORT DIV	LAS VEGAS	NV	DP	432
REYNOLDS ELEC ENGRG	SUPPORT SERVICES	LAS VEGAS	NV	DP	2,918
WACKENHUT SVS INC	NV SECURITY GUARDS	LAS VEGAS	NV	DP	267
					5,446
OAKLAND OPERATIONS OFFICE					
ROCKWELL INTERNATIONAL	ETEC	CANOGA PARK	CA	NE	151
STANFORD UNIV	LINEAR ACCELERATOR CT	STANFORD	CA	ER	1,292
UNIV OF CALIFORNIA	LAW BERLEKEY NATL LAB	BERKELEY	CA	ER	2,408
UNIV OF CALIFORNIA	LAW LIVERMORE NATL LA	LIVERMORE	CA	DP	6,009
					9,860
OHIO FIELD OFFICE					
EG&G INC	MOUND APPLIED TECH	MIAMISBURG	OH	DP	1,337
WESTINGHOUSE	W VALLEY DEMO PROJECT	WEST VALLEY	NY	EM	970
					2,307

03/22/95 DEPARTMENT OF ENERGY - CONTRACTOR EMPLOYMENT

DOE OPERATIONS OFFICE/ CONTRACTORS	ADDITIONAL INFO	CITY	STATE	PRGM	9/30/94 * ONBOARD
M&O CONTRACTORS					
OAK RIDGE OPERATIONS OFFICE					
MARTIN MARIETTA	MMES - Y-12 PLANT	OAK RIDGE	TN	EM	4,153
MARTIN MARIETTA	MMES - ORGDP	OAK RIDGE	TN	NE	3,144
MARTIN MARIETTA	MMES - ORNL	OAK RIDGE	TN	ER	4,690
MARTIN MARIETTA	MMES - GENERAL STAFF	OAK RIDGE	TN		3,818
MK FERGUSON OR CO	MMES - CONST MGMT	OAK RIDGE	TN	NE	1,025
OR INST SCI & ED	ORISE - RESCH AND OTH	OAK RIDGE	TN	ER	632
SE UNIV RES ASSOC	CEBAF	NEWPORT NEWS	VA	ER	474
					17,936
PITTSBURGH ENERGY TECH CENTER					
BDM OKL INC		BARTLESVILLE	OK	FE	215
					215
PITTSBURGH NAVAL REACTORS OFFICE					
WESTINGHOUSE	BETTIS ATOMIC POWER	PITTSBURGH	PA	NE	2,462
WESTINGHOUSE	NAVAL REACTOR FAC	IDAHO FALLS	ID	NE	788
					3,250
ROCKY FLATS OFFICE					
EG&G INC	RF OXNARD PLANT	OXNARD	CA	DP	6,216
EG&G INC	ROCKY FLATS PLANT	GOLDEN	CO	DP	52
WACKENHUT SVS INC	RF SECURITY GUARD SVS	GOLDEN	CO	DP	473
					6,741
RICHLAND OPERATIONS OFFICE					
BATTELE	PACIFIC NORTHWEST LAB	RICHLAND	WA	ER	4,383
HANFORD HEALTH FDN		RICHLAND	WA	EM	174
WESTINGHOUSE HANFORD		RICHLAND	WA	EM	8,088
					12,645
STRATEGIC PETROLEUM RESERVES OFC					
DYN MCDERMOTT	SPRO	NEW ORLEANS	LA	FE	954
					954
SAVANNAH RIVER OPERATIONS OFFICE					
UNIV OF GEORGIA	SREL	AIKEN	SC	ER	201
WACKENHUT SVS INC	SR SECURITY GUARD SVS	AIKEN	SC	DP	1,004
WESTINGHOUSE	SAVANNAH RIVER SITE	AIKEN	SC	DP	13,734
					14,939
SCHENECTADY NAVAL REACTORS OFFICE					
MARTIN MARIETTA	MARTIN MARIETTA-KAPL	SCHENECTADY	NY	NE	2,927
MARTIN MARIETTA	MARTIN MARIETTA-KAPLC	WINDSOR	CT	NE	45
					2,972
		M&O TOTAL			**121,702**

DOE OPERATIONS OFFICE/ CONTRACTORS	ADDITIONAL INFO	CITY	STATE	PRGM	9/30/94 * ONBOARD
NON-M&O CONTRACTOR					
ALBUQUERQUE OPERATIONS OFFICE					
CHEM-NUCL GEOTECH		GRAND JUNCTION	CO	NE	724
					724
FERNALD OFFICE					
FLOUR DANIEL	FD SERVICES - FERMCO	FERNALD	OH	EM	2,335
					2,335
PITTSBURGH ENERGY TECH CENTER					
MSE INC	MERDI	BUTTE	MT	FE	236
					236
RICHLAND OPERATIONS OFFICE					
BCS RICHLAND		RICHLAND	WA	NE	1,083
KAISER ENGR HANFORD		RICHLAND	WA	EM	2,305
					3,388
SAVANNAH RIVER OPERATIONS OFFICE					
BECHTEL	SR SITE ENGRG & CONST	AIKEN	SC	DP	4,089
					4,089
		NON M&O TOTAL			10,772
		DOE GRAND TOTAL			132,474

HUMAN RESOURCES AND ADMINISTRATION
ADVISORY COMMITTEES

Mr. Myers. Provide a list of advisory committees, a brief description of each, and the amount budgeted for each in fiscal years 1994, 1995 and 1996.

General Durham. The Department currently has 19 chartered advisory committees. A list of chartered advisory committees, a description of each committee, and the actual expenditures for Fiscal Year 1994 and the estimated budgets for Fiscal Year 1995 and 1996, taken from the Fiscal Year 1994 Annual Report, are shown in the tables that we would like to insert into the record. (The information follows:)

Key Information On Currently Chartered DOE Advisory Committees - 3/8/95

Committee Name	Date Established	Renewal Date	Next Renewal	Establishment Authority	Members Authorized
Advisory Committee on Demonstration & Commercial Application of Renewable Energy and Energy Efficiency Technologies (ACDCA), GSA # 443	12/11/89 P.L. 9/10/90 Chtr	9/10/92	9/10/94	Statutory	16
Advisory Committee on External Regulation of Department of Energy Nuclear Safety (ACERNS), GSA #	1/25/95 Chtr	1/25/97		Agency	20 Approx.
Advisory Committee on Human Radiation Experiments (ACHRE), GSA # 1884	1/15/94 E.O. 1/25/94 Chtr			Executive Order	15
American Statistical Association Committee on Energy Statistics (ASA), GSA # 82	10/17/84 Chtr	9/30/94	9/30/96	Agency	20 Approx.
Basic Energy Sciences Advisory Committee (BESAC), GSA # 133	10/16/86 Chtr	1/6/95	1/6/97	Agency	19 Approx.
Environmental Management Advisory Board (EMAB), GSA # 12	1/24/92 Chtr	1/18/94	1/18/96	Agency	30 Approx.
Environmental Management Site Specific Advisory Board (EMSSAB), GSA # 1889	5/16/94 Chtr		5/16/96	Agency	400
Federal Advisory Committee to Develop On-Site Innovative Technologies for Environmental Restoration Waste Management (FACDOIT), GSA # 95	12/10/92 Chtr	12/9/94	12/9/96	Agency	10
Fusion Energy Advisory Committee (FEAC), GSA # 444	4/18/91 Chtr	9/19/93	9/19/95	Agency	20 Approx.
High Energy Physics Advisory Panel (HEPAP), GSA # 178	1/13/67 Chtr	1/12/95	1/12/97	Agency	17 Approx.
Health and Environmental Research Advisory Committee (HERAC), GSA # 445	11/22/83 Chtr	11/22/93	11/22/95	Agency	25 Approx.
Hydrogen Technical Advisory Panel (HTAP), GSA # 446	11/15/90 P.L. 6/13/91 Chtr	7/13/93	7/13/95	Statutory	12
Inertial Confinement Fusion Advisory Committee/Defense Programs (ICFAC/DP), GSA # 10	4/14/92 Chtr	4/13/94	4/13/96	Agency	15 Approx.
Metal Casting Industrial Advisory Board (MCIAB), GSA # 447	10/15/90 P.L. 2/5/91 Chtr	12/30/93	12/30/95	Statutory	9
National Coal Council (NCC), GSA # 449	11/21/84 Chtr	11/23/93	11/23/95	Agency	125 (100-125)
National Electric and Magnetic Fields Advisory Committee (NEMF), GSA # 236	10/24/92 P.L. 1/14/93 Chtr	1/14/95	1/14/97	Statutory	10
National Petroleum Council (NPC), GSA # 452	5/3/46	11/23/93	11/23/95	Presidential Reque	175 Approx.
Secretary of Energy Advisory Board (SEAB), GSA # 453	1/2/90 Chtr	12/30/93	12/30/95	Agency	35 Approx.
State Energy Advisory Board (STEAB), GSA # 459	10/18/90 P.L. 11/29/91 Chtr	2/18/93	2/18/95	Statutory	21 18-21 Max.
Technical Advisory Committee on Verification Fissile Material and Nuclear Warhead Controls (TAC) (Inactive), GSA #	11/5/90 P.L. 5/14/91 Chtr			Statutory	9
Technical Panel on Magnetic Fusion (TPMF) (Inactive), GSA #	10/7/80 P.L. 5/18/90 Chtr			Statutory	20 Approx.

DEPARTMENT OF ENERGY ADVISORY COMMITTEES

1. Advisory Committee on External Regulation of Department of Energy Nuclear Safety

The Advisory Committee on External Regulation of Department of Energy Nuclear Safety was established on January 25, 1995. This Advisory Committee was established to provide advice, information and recommendation to the Secretary of Energy, the White House Office of Environmental Policy and the Office of Management and Budget, on whether and how new and existing Department of Energy facilities and operations might externally regulated to improve nuclear safety. The Advisory Committee shall conduct an assessment of the technical regulatory, institutional and resource issues related to the potential establishment of an external regulatory regime for nuclear safety with respect to Department of Energy facilities and operations. The Committee's deliberations may result in a set of regulatory options, rather than a single recommendation, for establishing external regulation of nuclear safety at Department of Energy facilities and operations. In this event, the Committee report shall include a discussion of the advantages and disadvantages for each proposed regulatory option.

2. Advisory Committee on Human Radiation Experiments

The Advisory Committee on Human Radiation Experiments (ACHRE) was established by Executive Order 12894, on January 15, 1994. The ACHRE was established to advise the Interagency Working Group on the ethical and scientific standards applicable to human radiation experiments carried out or sponsored by the United States Government. The duties of the Advisory Committee are solely advisory and shall be:

A. The Advisory Committee shall determine the ethical and scientific standards and criteria by which it shall evaluate human radiation experiments. The Advisory Committee shall consider whether:

    (a) there was a clear medical or scientific purpose for the experiments;

    (b) appropriate medical follow-up was conducted; and

    (c) the experiments' design and administration adequately met the ethical and scientific standards, including standards of informed consent, that prevailed at the time of the experiments and that exist today.

B. The Advisory Committee shall evaluate the extent to which human radiation experiments were consistent with applicable ethical and scientific standards as determined by the Committee pursuant to paragraph (a) of this section. If deemed necessary for such an assessment, the Advisory Committee may carry out a detailed review of experiments and associated records to the extent permitted by law.

C. If required to protect the health of individuals who were subjects of a human radiation experiment, or their descendants, the Advisory Committee may recommend to the Interagency Working Group that an agency notify particular subjects of an experiment, or their descendants, of any potential health risk or the need for medical follow-up.

D. The Advisory Committee may recommend further policies, as needed, to ensure compliance with recommended ethical and scientific standards for human radiation experiments.

E. The Advisory Committee may carry out such additional functions as the Interagency Working Group may from time to time request.

3. Advisory Committee on Demonstration and Commercial Application of Renewable Energy and Energy Efficiency Technologies

The Advisory Committee on Demonstration and Commercial Application of Renewable Energy and Energy Efficiency Technologies (ACDCA), formerly the Advisory Committee on Renewable Energy and Energy Efficiency Joint Ventures, was established by the Renewable Energy and Energy Efficiency Technology Competitiveness Act of 1989, Public Law 101-218, Section 6(b)(3), and the Energy Policy Act of 1992, Public Law 102-486 and was chartered on September 10, 1990. The ACDCA was amended to advise the Secretary of Energy on the development of the solicitation and evaluation criteria for commercialization ventures, and on otherwise carrying out his/her responsibilities under the Act. The Committee shall also advise the Secretary on the implementation of the commercialization ventures program.

4. American Statistical Association Committee on Energy Statistics

The American Statistical Association Committee on Energy Statistics (ASA) was established by the ASA at the request of the Secretary of Energy on October 17, 1984. This Committee was established to utilize the expertise of the ASA for review of elements of Energy Information Administration (EIA) information collection and analysis programs; advice on priorities of technical and methodological issues in the planning, operation and review of EIA statistical programs; and advice on matters concerning improved energy modeling and forecasting tools, particularly regarding their functioning, relevancy and results.

5. Basic Energy Sciences Advisory Committee

The Basic Energy Sciences Advisory Committee (BESAC) was established on October 16, 1986. The BESAC was established to provide advice to the

Secretary of Energy through the Director of Energy Research on elements of the Department's Basic Energy Sciences (BES) Program including advice on long-range plans, priorities, and strategies to address more effectively the scientific aspects of energy-related basic energy sciences issues of Departmental policies and programs. The Committee will provide recommendations, as requested, on appropriate levels of funding to develop those plans, priorities and strategies and to help maintain appropriate balance between competing elements of the BES program, and on scientific aspects of basic energy sciences issues of concern to DOE.

6. Environmental Management Advisory Board

The Environmental Management Advisory Board (EMAB), formerly the Environmental Restoration and Waste Management Advisory Committee, was established on January 24, 1992. The EMAB was established to provide information, advice and recommendations to the Assistant Secretary for Environmental Restoration and Waste Management (EM). Its primary functions include:

A. advise DOE on the process, content, public participation, and scientific, technical and other aspects of the analyses for the Programmatic Environmental Impact Statement (PEIS) and other projects;

B. regularly assess the progress of the PEIS;

C. review documents produced for the PEIS process as requested, and similarly, review the documents prepared for other EM projects assigned to the EMAB;

D. issue reports and recommendations; and

E. recommend options to resolve difficult issues faced in the EM program, including clean-up criteria and risk assessment, land use, priority setting and strategies for determining the future national configuration of waste management and disposal facilities.

7. Federal Advisory Committee to Develop On-Site Innovative Technologies for Environmental Restoration and Waste Management

The Federal Advisory Committee to Develop On-Site Innovative Technologies for Environmental Restoration and Waste Management (DOIT) was established on December 10, 1992, through a Memorandum of Understanding (MOU) signed in July 1991 by representatives from the U.S. Departments of Energy, Defense, Interior, the U.S. Environmental Protection Agency and the Western Governors' Association. The objective of the MOU is "to establish a more cooperative approach to development of technical solutions to environmental restoration and waste management problems shared by States, commercial entities, and the Federal government. The DOIT serves as the primary vehicle for recommending a program that can be adopted to implement the MOU regarding environmental restoration and waste management in Western States.

8. Environmental Management Site Specific Advisory Board

The Environmental Management Site Specific Advisory Board (EM SSAB) was established on May 16, 1994. The EM SSAB provides the Secretary of Energy, the Assistant Secretary for Environmental Restoration and Waste Management, the Director of the Office of Public Accountability and appropriate field site managers involved with the EM programs at the sites with policy information, advice, and recommendations concerning environmental restoration, waste management, and technology development activities. The EM SSAB will have the following duties:

A. Advise the Department of Energy on the process, content, public participation, and other policy aspects of EM's environmental restoration, waste management, and technology development activities;

B. Issue reports and recommendations; and

C. Recommend options to resolve difficult issues faced in the Environmental Restoration and Waste Management program, including site specific clean-up criteria and risk assessment, land use, priority setting, management effectiveness, cost vs. benefit analyses, and strategies for site waste management and disposal facilities.

9. Fusion Energy Advisory Committee

The Fusion Energy Advisory Committee (FEAC) was established on April 18, 1991. The FEAC provides advice and guidance, on a continuing basis, to the Director, Office of Energy Research, on the Fusion Energy Program, including:

A. Periodic assessments of both the magnetic and inertial fusion energy program issues and recommendations of any changes considered desirable on the basis of scientific and technological advances or other factors;

B. Advice on the merits of technical options, long-range plans, priorities, and strategies to demonstrate the scientific and engineering feasibility of fusion;

C. Advice on recommended levels of funding appropriate to implement those strategies and to help maintain appropriate balance among the various elements of the fusion energy program; and

D. Advice and guidance on any issues relating to the fusion energy program as requested by the Secretary or the Director, Office of Energy Research.

10. Health and Environmental Research Advisory Committee

The Health and Environmental Research Advisory Committee (HERAC) was established on November 22, 1983. The HERAC was established to conduct periodic reviews of elements of the Health and Environmental Research Program and provide advice on long-range plans, priorities, and strategies to address more effectively the scientific aspects of energy-related health and environmental issues of Departmental policies and programs. Advice would also be sought on appropriate levels of funding to develop those plans, priorities, and strategies, and to help maintain appropriate balance between competing elements of the program.

11. High Energy Physics Advisory Panel

The High Energy Physics Advisory Panel (HEPAP) was established on January 13, 1967. The HEPAP was established to provide advice and guidance on a continuing basis to the Secretary of Energy, through the Director of Energy Research, on the national high energy physics research program, including:

A. periodic reviews of the program and recommendation of any changes considered desirable on the basis of scientific and technological advances or other factors;

B. advice on long-range plans, priorities, and strategies for the national high energy physics program;

C. advice on recommended appropriate levels of funding to assure a world leadership position, and to help maintain appropriate balance between competing elements of the program; and

D. advice and guidance on any issues relating to the program as requested by the Secretary or the Director of Energy Research.

12. Hydrogen Technical Advisory Panel

The Hydrogen Technical Advisory Panel was established by the Spark M. Matsunaga Hydrogen Research, Development, and Demonstration Act of 1990, Public Law 101-566, Section 108, and was chartered on June 13, 1991. The HTAP will advise and make any necessary recommendations to the Secretary of Energy on the following items:

A. the implementation and conduct of programs required by the Act;

B. the economic, technological, and environmental consequences of the deployment of hydrogen production and use systems; and

C. the contents of the comprehensive 5-year program plan required by the Act.

13. Inertial Confinement Fusion Advisory Committee/Defense Programs

The Inertial Confinement Fusion Advisory Committee/Defense Programs (ICFAC/DP) was established on April 14, 1992. The ICFAC/DP provides advice and guidance to the Assistant Secretary for Defense Programs on both technical and management aspects of the inertial confinement fusion program.

14. Metal Casting Industrial Advisory Board

The Metal Casting Industrial Advisory Board (MCIAB) was established by the Department of Energy Metal Casting Competitiveness Research Act of 1990, Public Law 101-425, Section 7 and was chartered on February 5, 1991. The MCIAB will advise the Secretary of Energy on the implementation of the selection criteria of a required solicitation of proposals for establishing at least four National Metal Casting Research Institutes in the different census regions where the metal casting industry is concentrated, and on otherwise carrying out his responsibilities under the Department of Energy Metal Casting Competitiveness Research Act. On an annual basis the MCIAB will also, review the Secretary's solicitation and selection of research proposals and make recommendations as to how each such activity can be altered so as to better achieve the purposes of this Act; and review the research activities of each selected applicant, and the selected applicant's management plan, and report its findings and recommendations to the Secretary.

15. National Coal Council

The National Coal Council (NCC) was established on November 21, 1984 to provide advice and recommendations on a continuing basis as requested by the Secretary of Energy on general policy matters relating to coal, including:

A. Federal policies which affect, directly or indirectly the production, marketing, and use of coal;

B. plans, priorities, and strategies to address more effectively the technological, regulatory, and social impact issues relating to coal production and use;

C. appropriate balance between various elements of federal coal-related programs;

D. scientific and engineering aspects of coal technologies, including emerging coal conversion, utilization, or environmental control concepts; and

E. the progress of coal research and development, pursuant to the Office of Coal Research Act, Public Law 86-599.

16. National Electric and Magnetic Fields Advisory Committee

The National Electric and Magnetic Fields Advisory Committee (EMF) was established by the Energy Policy Act of 1992, Section 2118(d)(1) and was chartered on January 14, 1993. The EMF advises the Secretary of Energy and the Director of the National Institute of Environmental Health Sciences with respect to the design and implementation of the program, including preparation of solicitations for proposals to conduct research under the program. The committee will review reports that summarize activities and their results from individuals who conduct activities under the program. The committee will provide advice to the Interagency Committee on Electric and Magnetic Fields in legislatively mandated reports to the Secretary of Energy and the U.S. Congress.

17. National Petroleum Council

The National Petroleum Council (NPC) was established by the Secretary of Interior on May 3, 1946, at the request of President Harry S. Truman. The NPC was transferred to the Department of Energy after DOE's formal establishment on October 1, 1977. The NPC was established to continue government-industry cooperation which had begun during World War II and currently provides the Secretary of Energy with advice, information, and recommendations on matters relating to oil and gas or the oil and gas industry.

18. Secretary of Energy Advisory Board

The Secretary of Energy Advisory Board (SEAB) was established on January 2, 1990. The SEAB was established to advise the Secretary of Energy on the research, development, energy, and national defense responsibilities, activities, and operations of the Department of Energy (DOE) and to provide expert guidance in these areas to the DOE.

19. State Energy Advisory Board

The State Energy Advisory Board (STEAB) was established by the Energy Policy and Conservation Act, Section 365 (42 U.S.C 6325; the "Act"), and was chartered on November 29, 1991. The STEAB was established to advise the Secretary through the Assistant Secretary for Conservation and Renewable Energy on the following:

A. energy efficiency goals and objectives of programs and make administrative and policy recommendations to improve these programs;

B. serve as a liaison between States and the Department of Energy on energy conservation and renewable energy resource programs; and

C. encourage transfer of the results of the energy conservation and renewable energy activities carried out by the Federal Government.

20. **Technical Advisory Committee on Verification of Fissile Material and Nuclear Warhead Controls** (Inactive - Requested Termination)

The Technical Advisory Committee on Verification of Fissile Material and Nuclear Warhead Controls (TAC) was established by the National Defense Appropriation Act for Fiscal Year 1991, Public Law 101-510, Section 3151, and was chartered May 16, 1991. The TAC was established to advise the President, through the Secretary of Energy, on the availability, use, and further development of techniques which could be applied to warhead dismantlement, production controls, and disposition. The Committee will assist in preparing a Report to Congress on these issues. The Committee has completed its final report and is inactive while awaiting legislation to terminate.

21. **Technical Panel on Magnetic Fusion** (Inactive - Requested Termination)

The Technical Panel on Magnetic Fusion (TPMF) was established by the Magnetic Fusion Engineering Act of 1980, Public Law 96-386, Section 7, and was rechartered on May 18, 1990. The TPMF was established to perform a review of the conduct of the national magnetic fusion energy program and make recommendations on the following items, among others:

A. the preparation of the 5-year program plan required by Section 5 of the Act;

B. the type of future facilities needed to meet the goals of the Act along with their projected completion dates;

C. the adequacy of participation by universities and industry in the program;

D. the adequacy of international cooperation in magnetic fusion and any problems associated therewith; and,

E. institutional, environmental, and economic factors limiting, or prospectively limiting, efforts to achieve commercial application of magnetic fusion energy systems.

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Enclosure 1

BUDGET INFORMATION FOR ADVISORY COMMITTEES

FEDERAL ADVISORY COMMITTEES	SITE LOCATION	ACTUAL EXPENDITURES	PROJECTED COSTS	BUDGET REQUEST
		(Whole Dollars)		
		FY 1994	FY 1995	FY 1996 *
Advisory Committee on External Regulation of Department of Energy Nuclear Safety	Washington, D.C.	0	1,000,000	0
Advisory Committee on Human Radiation Experiments 1/	Washington, D.C.	1,443,360	4,500,000	0
Advisory Committee on Demonstration and Commercial Application of Renewable Energy and Efficiency Technologies 2/	Washington, D.C.	203,650	207,900	214,137
American Statistical Association Committee on Energy Statistics	Washington, D.C.	58,191	62,200	64,066
Basic Energy Sciences Advisory Committee	Washington, D.C.	299,000	358,000	368,740
Environment, Safety & Health Advisory Committee 3/	Washington, D.C.	7,600	0	0
Environmental Management Advisory Board	Washington, D.C.	1,010,452	1,400,000	1,442,000
Environmental Management Site Specific Advisory Board	Washington, D.C.	1,353,182	2,583,928	2,318,257
Fernald Site	Cincinnati, OH	218,450	394,696	152,182
Grand Junction Site	Monticello, UT	14,903	87,313	128,907
Hanford Site	Richland, WA	449,551	782,500	482,170
Idaho Site	Idaho Falls, ID	42,873	140,289	140,289
Los Alamos Site	Los Alamos, NM	0	35,000	90,000
Nevada Site	Las Vegas, NV	35,180	76,390	122,390
Oak Ridge Site	Oak Ridge, TN	6,000	129,975	257,325
Pantex Site	Amarillo, TX	241,502	350,461	345,063
Rocky Flats Site	Golden, CO	208,660	447,103	497,730
Sandia Site	Albuquerque, NM	38,000	88,000	50,000
Savannah River Site	Aiken, SC	98,063	52,201	52,201

Enclosure 1

BUDGET INFORMATION FOR ADVISORY COMMITTEES

FEDERAL ADVISORY COMMITTEES	SITE LOCATION	ACTUAL EXPENDITURES	PROJECTED COSTS	BUDGET REQUEST
		(Whole Dollars)		
		FY 1994	FY 1995	FY 1996 *
Federal Advisory Committee to Develop On-Site Innovative Technologies for Environmental Restoration and Waste Management	Washington, D.C.	894,707	1,108,641	1,141,900
Federal Fleet Conversion Task Force 4/	Washington, D.C.	181,000	0	0
Fusion Energy Advisory Committee	Washington, D.C.	10,000	154,000	158,620
Health and Environmental Research Advisory Committee	Washington, D.C.	117,250	125,000	128,750
High Energy Physics Advisory Panel	Washington, D.C.	97,800	99,600	102,588
Hydrogen Technical Advisory Panel	Washington, D.C.	70,137	70,337	72,447
Inertial Confinement Fusion Advisory Committee/Defense Programs	Washington, D.C.	217,508	169,300	174,379
Metal Casting Industrial Advisory Board	Washington, D.C.	87,523	113,000	116,390
National Coal Council	Washington, D.C.	51,300	60,000	61,800
National Electric and Magnetic Fields Advisory Committee	Washington, D.C.	142,869	149,000	153,470
National Petroleum Council	Washington, D.C.	259,000	220,000	226,600
Secretary of Energy Advisory Board	Washington, D.C.	475,228	685,234	705,791
State Energy Advisory Board	Washington, D.C.	161,000	189,000	194,670

Enclosure 1

BUDGET INFORMATION FOR ADVISORY COMMITTEES

FEDERAL ADVISORY COMMITTEES	SITE LOCATION	ACTUAL EXPENDITURES	PROJECTED COSTS	BUDGET REQUEST
		(Whole Dollars)		
		FY 1994	FY 1995	FY 1996 *
Technical Advisory Committee on Verification of Fissile Material and Nuclear Warhead Controls 5/	Washington, D.C.	0	0	0
Technical Panel on Magnetic Fusion 6/	Washington, D.C.	0	0	0
TOTAL		7,140,757	13,255,140	7,644,605

* FY 1996 Budget Request column reflects FY 1995 anticipated costs adjusted upward for inflation for all advisory committees, except the Environmental Management Site Specific Advisory Board.

1/ Established by Executive Order 12891, January 15, 1994

2/ Formerly the Advisory Committee on Renewable Energy and Energy Efficiency Joint Ventures.

3/ Terminated in Fiscal Year 1994.

4/ Presidential committee terminated in Fiscal Year 1994.

5/ Inactive, pending legislation to terminate the committee.

6/ Inactive, pending legislation to terminate the committee.

HUMAN RESOURCES AND ADMINISTRATION
DOE-SPONSORED CONFERENCES

Mr. Myers. Please provide a list of all conferences sponsored by DOE. Include the number of DOE employees attending, the number of contractor employees, the location and purpose of the conference.

General Durham. The Department does not maintain an official list of all DOE-sponsored conferences; however, most key conferences are included on the Secretary's calendar. A table showing those conferences included on the Secretary's calendar during fiscal year 1994 is provided for the record. (The information follows:)

DEPARTMENTAL CONFERENCE ACTIVITIES
FISCAL YEAR 1994

TITLE/PURPOSE	LOCATION	DOE ATTENDANCE	DOE CONTRACTORS
1993 Plutonium/Uranium Recovery Operations Conference	Augusta, GA	7	84
Quantitative Ecotoxicology/ An Hierarchical Approach	Aiken, SC	3	15
American Statistical Association Committee on Energy Statistics	Washington, DC	30	5
DOE Annual Scientific and Technical Information Meeting	Oak Ridge, TN	40	150
Joint Technical Meeting on Coal Technology	Albuquerque, NM	15	15
Pittsburgh Coal Conference	Pittsburgh, PA	26	10
Liquefaction Contractors Technical Review	Pittsburgh, PA	20	140
Clean Coal Technology Third Annual Conference	Chicago, IL	45	160
Fuel Cells Contractors Technical Review	Morgantown, WV	75	75
International Symposium on Combustion	Irvine, CA	8	20
Calorimetry Conference	Santa Fe, NM	0	2
Coal Preparation, Utilization, and Environmental Control Contractors Technical Review	Pittsburgh, PA	60	240
Coal-Fired Power Systems '94: Pressurized Fluidized Bed Combustion and Integrated Gasification Combined Cycle Contractors Technical Review	Norman, OK	2	2
American Association of Petroleum Geologists Annual Meeting	Denver, CO	2	2
University of Coal Research Contractors Technical Review	Pittsburgh, PA	30	160

TITLE/PURPOSE	LOCATION	DOE ATTENDANCE	DOE CONTRACTORS
International Petroleum Production: Forging New Alliances Conference	Norman, OK	2	2
Organizing Meeting of the Tulsa University Petroleum Environmental Research Center	Tulsa, OK	1	2
Management of High Sulfur Coal Combustion Residues: Issues and Practices Conference	Springfield, IL	2	3
In Situ Combustion Practices: Past, Present, and Future Application Conference	Tulsa, OK	1	4
Historically Black Colleges and Universities Research and Development Technology Transfer Symposium	Birmingham, AL	14	2
Improved Oil Recovery Symposium	Tulsa, OK	12	30
"HIPPS Today" Workshop	Pittsburgh, PA	25	45
Materials for Advanced PC Power Generation Systems Review	Pittsburgh, PA	9	41
Regional Technology Transfer Meetings for High Efficiency SO2 Removal	Dallas, TX and Pittsburgh, PA	2	3
Simpson and Viola Groups in the Southern Midcontinent Workshop	Norman, OK	1	1
International Conference on Coal Utilization and Slurry Technologies	Clearwater, FL	11	4
Energy, Environment, and Global Economic Growth Symposium	Tulsa, OK	0	0
Granular Flow ARO Spring Review and Planning Meeting	Pittsburgh, PA	2	18
Clean Coal Technology Transfer Program Public Meeting	Washington, DC	20	0
Technology Working Group Meeting for Utility Air Toxic Emissions Characterization	Durham, NC	4	20

TITLE/PURPOSE	LOCATION	DOE ATTENDANCE	DOE CONTRACTORS
University Coal Research Contractors Review	Pittsburgh, PA	25	8
Natural Gas Recovery Contractors Review	Morgantown, WV	15	30
Hunton Group Core Workshop and Field Trip	Norman, OK	2	0
International Conference on the Clean and Efficient Use of Coal "The New Era for Coal and Lignite"	Hong Kong	5	5
DOE Annual Scientific and Technical Information Meeting	Oak Ridge, TN	215	275
15th Annual DOE Low Level Radioactive Waste Management Conference	Phoenix, AZ	16	84
Information Exchange Meetings	Salt Lake City, UT	40	120
Environmental Information Exchange Meeting with Industry	Seattle, WA	25	80
Waste Management 94	Tucson, AZ	175	225
1994 International Symposium on Decontamination and Decommissioning	Knoxville, TN	180	225
Pollution Prevention Conference X for EM	Denver, CO	70	320
Spectrum 94	Atlanta, GA	200	200
1st International Environmental Technical and Business Action Conference	St. Petersburg, Russia	7	10
Oak Ridge Computer Model Conference	Oak Ridge, TN	75	150
Eleventh Office Information Technology Conference	Chicago, IL	55	131
Electronic Mail/File Transfer Program Review	Kansas City, MO	15	35
Telecommunications Conference	Baltimore, MD	72	100
Partnerships in Information Management	Charlotte, NC	68	227

TITLE/PURPOSE	LOCATION	DOE ATTENDANCE	DOE CONTRACTORS
DOE Computer Security Group Training Conference	Denver, CO	71	247
DOE Personnel Conference	Baltimore, MD	57	0
DOE Work for Others Annual Meeting	Bethesda, MD	43	27
The Nonproliferation Experiment Results and Implications for Test Ban Treaties	Rockville, MD	8	71
Senior Associates Service Conference	Albuquerque, NM	7	2
Winter Fuels Outlook Conference	Washington, DC	40	4
Western States Energy Emergency Seminar	Las Vegas, NV	11	4
Eastern States Energy Emergency Seminar	Baltimore, MD	13	4
Emergency Management Issues Special Interest Group	Kansas City, MO	82	47
Armenia Second National Energy Strategy Conference	Yerevan, Armenia	4	2
IEA/U.S. DOE International Workshop on Industrial Energy Efficiency Policies and Programs	Washington, DC	15	6
Miami Conference on the Caribbean and Latin America	Miami, FL	3	0
DOE/NARUC Gas Conference	Nashville, TN	10	0
DOE/EPA Workshop on Using Contingent Valuation to Measure Non-market Values	Herndon, VA	4	4
International Conference on High-Level Radioactive Waste Management	Las Vegas, NV	130	330
Technology Transfer Process Workshop	Kansas City, MO	150	150
Technology Transfer Communications Conference	Oak Ridge, TN	49	71

TITLE/PURPOSE	LOCATION	DOE ATTENDANCE	DOE CONTRACTORS
Regional Partner Feedback Meeting	Pittsburgh, PA	20	10
Regional Partner Feedback Meeting	Oak Ridge, TN	12	30
Regional Partner Feedback Meeting	Chicago, IL	13	17
Regional Partner Feedback Meeting	Seattle, WA	2	10
Regional Partner Feedback Meeting	Albuquerque, NM	10	16
National Partner Feedback Conference	Washington, DC	34	37
Regional Partner Feedback Meeting	Atlanta, GA	12	17
DOE and Energy Communities Alliance Economic Development Workshop	Potomac, MD	27	23
DOE Economic Development Guidelines Review	Herndon, VA	25	17
DOE and Community Economic Development Working Group Quarterly Meeting	Albuquerque, NM	31	18
AL Facilities Planning Meeting	Albuquerque, NM	56	19
Safety Management Workshop	Albuquerque, NM	50	28
Sixth National TIE Workshop	Kennewick, WA	16	630
Fifth National TIE Workshop	Denver, CO	50	400
U.S. DOE Defense Programs Packaging Workshop	Knoxville, TN	30	70
Financial Management Division Annual Year-End Conference	Albuquerque, NM	30	40
1994 DOE Regional Partners' Feedback Meeting	Las Vegas, NV	20	40
States and Tribes Coordinating Meeting	San Antonion, TX	38	18
Fire Safety Conference	Albuquerque, NM	30	270
Title 10, Code of Federal Regulations Part 710 Conference	Albuquerque, NM	40	30

TITLE/PURPOSE	LOCATION	DOE ATTENDANCE	DOE CONTRACTORS
Stakeholder Forum	Albuquerque, NM	8	16
System Prioritization Method Stakeholder Exchange	Carlsbad, NM	8	19
Resource Contingency Program Scoping Meetings	Elma, WA Hermiston, OR Chehalis, WA	3 3 3	0 0 0
Commercial Services and Rates Working Group Transmission Issues	Portland, OR	7	1
Hermiston Generating Project EIS Scoping Meeting	Hermiston, OR	2	0
Commerical Services and Rates Comprehensive Wheeling, Rate Review Meeting	Portland, OR	11	2
NW Washington/Puget Power Transmission Project: Open House Meetings	Sedro Woolley, WA	2	0
Comprehensive Project Update and Draft Business Plan Meeting	Portland, OR	9	1
DOE/BPA Public Hearings: Draft Government Corporation Legislation	Seattle, WA Spokane, WA Missoula, MT	5 7 2	0 0 0
Northwest Power Planning Council: Hearings on Draft Government Corporation Legislation	Boise, ID Portland, OR	1 2	0 0
Klahanie Substation and Tap Draft EA	Issaquah, WA	3	1
Draft Business Plan: Strategic Guidance Overview and Discussion	Portland, OR	7	1
Business Plan EIS: Environmental Group Meting	Portland, OR	3	1
Wind Generation Projects Joint Environmental Scoping Meetings	White Salmon, WA Goldendale, WA	2 3	0 0
7(b)(2) Rate Test Methodology Meeting	Portland, OR	7	2

TITLE/PURPOSE	LOCATION	DOE ATTENDANCE	DOE CONTRACTORS
Coyote Springs Congeneration Project DEIS Public Comment Open House	Boardman, OR	3	1
Business Plan: Power and Resource Strategic Action Plan Information Team	Portland, OR	9	2
Wheeling Rates Subgroup Meeting (Power and Resource Strategic Action Plan)	Portland, OR	6	2
Tiered Rates Work Group Meeting (Power and Resource Strategic Action Plan)	Portland, OR	11	2
Camas Prairie Wildlife Mitigation Project Meeting	Fairfield, ID	3	0
Northwest Regional Power Facility Project Scoping Meetings	Creston, WA	2	0
	Spokane, WA	2	0
	Olympia, WA	2	0
Pack River/Clark Fork Wildlife Mitigtion Meeting	Sandpoint, ID	3	0
Pacific Power and Light Capacity Agreement Draft EIS Public Comment Meeting	Portland, OR	6	1
Nez Perce Tribal Hatchery Project EIS Scoping Meetings	Boise, ID	3	2
	Spalding, OR	3	2
BPA Business Plan: Tiered Rates Work Group	Portland, Or	11	0
BPA/PUC Consultation Meeting	Portland, OR	3	0
1995 Rates: Marginal Cost Analysis Technical Meeting	Portland, OR	6	0
Draft Business Plan and EIS: Regional Comment Meetings	Coeur d'Alene, ID	3	0
	Seattle, WA	4	0
	Portland, OR	5	1
Fish Hatchery Programmatic EIS Scoping Meetings	Astoria, OR	3	2
	Portland, OR	5	0
Marginal Cost Analysis Technical Discussion	Portland, OR	5	1

TITLE/PURPOSE	LOCATION	DOE ATTENDANCE	DOE CONTRACTORS
Integrated Hatcheries Operations Team Public Meetings	Boise, ID	3	0
	Lewiston, ID	3	0
	Pasco, WA	3	0
	Seattle, WA	2	0
	Portland, OR	6	2
System Operation Review Draft EIS Comment Meetings	Kalispell, MT	4	1
	Libby, MT	4	1
	Grand Coulee, WA	3	0
	Lewiston, ID	3	1
	Pasco, WA	3	0
Fourth Workshop on the Role of Point Defects/Defect Complexes in Silicon Device Processing	Beaver Creek, CO	0	13
Thermophotovoltaic Generation of Electricity	Copper Mountain, CO	0	29
DOE Property Protection Conference	Breckenridge, CO	18	19
PV Performance and Reliability Workshop	Lakewood, CO	3	35
Biomass Oil Pyrolysis Combustion	Estes Park, CO	0	13
A Specialists Workshop on Applications Free Jet Molecular Beam, Mass Spectrometric Sampling	Estes Park, CO	0	14
1994 SEC All States Conference	Biloxi, MS	90	19
Seventh Annual INEL Computing Symposium	Idaho Falls, ID	9	10
Industrial Exchange Workshop	San Antonio, TX	5	20
Waste Characterization Data Format Work Group	Las Vegas, NV	8	44
Annual DOE/NV Occupational, Safety, Health Symposium	Las Vegas, NV	175	175
1994 DOE Contractors Diversity Training Seminar	Las Vegas, NV	82	83
7th Annual DOE//NV Quality Improvement Seminar	Las Vegas, NV	49	339
Waste Acceptance Program Work Group	Las Vegas, NV	5	19

TITLE/PURPOSE	LOCATION	DOE ATTENDANCE	DOE CONTRACTORS
38th Annual DOE Prime Contractors Purchasing Managers Conference	Las Vegas, NV	6	107
Tech Transfer Regional Partners Feedback Conference	Oakland, CA	25	50
Energy Expo	Oakland, CA	100	900
Small Business Workshop	San Ramon, CA	0	300
Tech Transfer Regional Partners Feedback Conference	Oakland, CA	0	0
The Nuclear Energy Forum	San Francisco, CA	50	0
Environmental Workshop	Pleasanton, CA	0	0
DOE Education Program Directors Meeting	Berkeley, CA	50	0
Declassification Stakeholders Meeting	San Francisco, CA	50	50
Bay Area Science and Technology Education Collaboration (BASTEC) Annual Conference	Oakland, CA	0	0
AAAS Annual Meeting	San Francisco, CA	0	0
Expanding Your Horizons in Science and Math Education	Modesto, CA	0	0
United Nations Fourth World Conference on Women	Oakland, CA	50	450
Small Business Workshop	Stockton, CA	0	0
Fourth International Conference on Aerogels	Berkeley, CA	0	0
National Hispanic Chamber of Commerce	San Francisco, CA	0	0
International Decontamination and Decommissioning Symposium	Knoxville, TN	100	1000
Oak Ridge Model on Waste Management and Environmental Restoration	Oak Ridge, TN	56	429
1994 DOE Oak Ridge Operations Office Contractor Conference in Equal Employment Opportunity/Affirmative Action (EEO/AA)	Knoxville, TN	10	94

TITLE/PURPOSE	LOCATION	DOE ATTENDANCE	DOE CONTRACTORS
Vendors Conference '94	Arvada, CO	100	50
Integrated Planning Workshop from Strategic Planning to Baseline and Other Objectives	Golden, CO	75	275
1994 DOE Contractors' Human Resource Conference	Seattle, WA	4	42
Ab-Initio Basis of Semi-Empirical Pi-Electron Theory	Richland, WA	0	37
Ab-Initio Calculations with Complex Environments	Richland, WA	0	21
Accurate Valence-Bond Interpretable Wave Functions	Richland, WA	0	22
Annual Conference of Managing Editors	Richland, WA	0	15
An Overview od the Egyptian Information Technology	Richland, WA	0	50
Atmospheric Studies and Complex Terrain (ASCOT) Science Meeting	Richland, WA	1	20
Atomistic Simulation of Surface Diffusion on Metals	Richland, WA	0	35
Biotechnology Colloquim	Richland, WA	5	53
Calculation of NMR Chemical Shieldings by the GIAO Method	Richland, WA	0	30
Catalysis	Richland, WA	0	10
Characterization of Aerosols Using Mass Spectrometry	Richland, WA	0	20
Chemicals Industry Analysts Workshop	Washington, DC	0	16
Chemistry on a Piece of Salt	Richland, WA	0	34
Computational Design of New Molecules, Bonds and Structural Models	Richland, WA	0	30
Computational Modeling Workshop	Seaside, OR	1	7
Computing at the SSC Laboratory	Richland, WA	0	30

TITLE/PURPOSE	LOCATION	DOE ATTENDANCE	DOE CONTRACTORS
Density Functional Theory and Large-Scale Quantum Simulations	Richland, WA	0	20
DOE 1994 Radiation Protection Workshop	Atlanta, GA	0	0
Dynamics of Anion Solvation	Richland, WA	0	30
Environmental and Molecular Sciences Lab (EMSL) Collaboratory Workshop	Richland, WA	4	2
Electrified Microheterogeneous Catalysis in Aqueous Zeolite	Richland, WA	0	36
Electric Field and Vibrational Shifts of Chemisorbed Molecules	Richland, WA	0	30
Energy Efficiency and the Global Environment	Newport Beach, CA	5	7
Energy Research Supercomputer Users Groups (ERSUG)	Richland, WA	2	10
Environmental Electrochemistry Symposium	Richland, WA	2	34
Environmental Electrochemistry Symposium: Chemical Analysis and Remediation Applications	Richland, WA	0	28
Epitaxial Growth and Characterization of Ultrathin Ionic Films	Richland, WA	0	20
Flow-Through Detectors	Richland, WA	0	21
Geographic Information System Information Exchange (GISIE) Conference	Richland, WA	1	35
Groundwater Challenge Work Group	Richland, WA	3	25
Hanford Contractors Suspect/Counterfeit Items Interface Meting	Richland, WA	3	12
33rd Hanford Symposium on Health and the Environment	Pasco, WA	2	68
High Resolution Vibrational and Rotational Spectroscopy of Molecular	Richland, WA	0	21

TITLE/PURPOSE	LOCATION	DOE ATTENDANCE	DOE CONTRACTORS
High-Performance Computational Chemistry Conference	Richland, WA	0	18
High-Speed MAS of Quadrupolar Nuclei/Application to Materials	Richland, WA	0	17
Holographic Imaging of Adsorbates on Si (111) and Si (100) by Energy-Dependent Photoelectron Diffraction	Richland, WA	0	30
How Big a Cluster Does it Take to Make a Liquid?	Richland, WA	0	40
Intercalculation Chemistry at the Submicron Level	Richland, WA	0	25
Interfacial Spectroscopy and Chemical Sensing Using Planar Integrated	Richland, WA	0	20
Intermolecular Potentials and Photodissociation Dynamics of Radical-Rae Gas Complexes	Richland, WA	0	40
Investigation of Ni and Ti Growth on (100) and (110) Aluminum Surfaces Using High Energy Ion Scattering, X-ray Photoelectron Diffraction	Richland, WA	0	29
In Vivo Electron Paramagnetic Resonance	Richland, WA	0	34
Large Molecular Epitaxy by Vacuum Deposition	Richland, WA	0	50
Large Molecular Epitaxy by Vacuum Deposition	Richland, WA	0	40
Laser Studies of Molecules at Liquid Interfaces	Richland, WA	0	34
Low Level Liquid Radioactive Waste Technical Meeting	Oslo, Norway	1	1
Low Level Radioactive Liquid Waste Visit by Joint Russian/Norwegian/United States technical team	Richland, WA	4	25
Low-Activity Waste Disposal Workshop	Pasco, WA	15	80

TITLE/PURPOSE	LOCATION	DOE ATTENDANCE	DOE CONTRACTORS
Low-Activity Waste Workshop	Richland, WA	12	65
Minority-owned Business Technology Transfer Consortium (MBTTC)	Richland, WA	2	
Low-Activity Waste Technical Workshop	Richland, Wa	12	65
Minority-owned Business Technology Transfer Consortium (MBTTC)	Richland, Wa	2	24
Microwave Dielectric Studies of the Spin Density Wave State	Richland, WA	0	27
Molecular Recognition in Organic and Biochemical Systems	Richland, WA	0	32
Near-Field Optical Spectroscopy of Single Molecules	Richland, WA	0	19
Northwest Lectureship Series	Richland, WA	0	26
Ocean Model Test Problems Workshop	Santa Fe, NM	0	5
OEM/OER Collaboration Meeting	Washington, DC	50	20
On the Choice of Zeroth-Order Hamiltonian for Second-Order	Richland, WA	0	34
Portland Gas and Electric (PG&E)and DOE Building Operation Workshop #1	Boulder, CO	2	7
PG&E/DOE Building Operation Workshop #2	Ft. Worth, TX	2	2
Particle Microbeam Applications Workshop	Richland, WA	1	9
Picosecond Transient Raman Spectroscopy	Richland, WA	0	34
Potential Energy Surfaces for Chemical Reactions	Richland, WA	0	27
Probing the Dynamics of Disordered Crystals	Richland, WA	0	46
Radiation Damage in DNA	Salishan, Oregon	0	14
Reactions of Hydrogen on the Si(100)-2x1 Surface	Richland, WA	0	27

TITLE/PURPOSE	LOCATION	DOE ATTENDANCE	DOE CONTRACTORS
Real Time Versus 'Imaginary Time' Methods of computing Quantum	Richland, WA	0	41
Regional DOE Partners' Feedback Conference	Seattle, WA	10	19
Residential Ventilation and Indoor air quality -- Issues and solutions	Richland, WA	0	20
Sample Management Working Group meeting and Data Validation/Verification Workshop	Richland, WA	12	81
Sequence-Specific Effects	Richland, WA	0	45
Simulation Studies of Bulk and Surface Properties of Catalyst Minerals and Ceramics	Richland, WA	0	34
Siting Energy Facilities	San Francisco, CA	2	2
Solids Liquids Seminar	Richland, WA	3	45
Surface Structures of Iron Oxide and Ice	Richland, WA	0	29
Technology Transfer Workshop for Small Minority-Owned and Women-Owned Business	Pasco, WA	0	6
Tank Waste Remediation System Technology Development Workshop	Richland, WA	6	65
Technology Transfer General Awareness Course	Seattle, WA	5	10
The General Three Body Problem in Molecular Physics	Richland, WA	0	20
Theoretical Models for Eley-Rideal Surface Reactions	Richland, WA	0	20
Theoretical Models of Anisole Hydrolysis in Supercritical Water	Richland, WA	0	15
U.S. - Mexico Innovative Technology Meeting	Richland, WA	4	24
Vibrational Spectroscopy of Model Anions Complexed with water on Surface	Richland, Wa	0	29

TITLE/PURPOSE	LOCATION	DOE ATTENDANCE	DOE CONTRACTORS
Workshop for DOE Environmental Surveillance Contractors	Albany, NY	1	30
X-ray Photoelectron Spectroscopy (XPS) Characterization of Organic	Richland, WA	0	17
XPS Studies of Ti02 Surfaces	Richland, WA	0	19
Environmental Restoration 1993	Augusta, GA	185	350
Decommissioning and Deactivation Strategies	Augusta, GA	12	23
Migration 1993	Charleston, SC	50	70
Departmental Integrated Standardized Core Accounting System and Management Analysis and Reporting System Meeting	Augusta, GA	23	0
Technical Program Managers Problem-Solving	Atlanta, GA	1	12
Dry Storage Project Development Working Group	Augusta, GA	20	50
Environment, Safety and Health Resource Management Performance Improvement Team	Augusta, GA	30	9
Budget Stakeholders Group Conference	Augusta, GA	37	31
Dry Storage Technology	Aiken, SC	2	14
Dry Storage	Aiken, SC	1	20
Digital Radiotherapy Technical Exchange	Hanford, WA	1	21
Dry Storage Development	Aiken, SC	0	6
Technology Transfer	Atlanta, GA	20	25
Quantitative Ecology	Aiken, SC	3	15
Complex TQ Meeting	Denver, CO	15	15
Dry Storage Project Demonstration	Aiken, SC	10	30
Technology Commercialization	Atlanta, GA	0	25
Spectrum 94	Atlanta, GA	135	405
Dry Storage	Aiken, SC	0	7

TITLE/PURPOSE	LOCATION	DOE ATTENDANCE	DOE CONTRACTORS
Safety Committees' Workshop	Denver, CO	105	0
Western Records Managers Meeting	Golden, CO	14	9
Environmental Conference	Denver, CO	87	11
NREL Photovoltaic Advanced Research and Development 12th Annual Review Meeting	Denver, CO	6	115
Building - Integrated Photovolatics Experts Workshop	Brighton, MA	1	2
Fourth Annual Montana Ethanol Conference and Workshop	Missoula, MT	0	1
10th International Symposium on Alcohol Fuels	Colorado Springs, CO	13	13
International Absorption Heat Pump Conference '94	New Orleans, LA	2	0
Biobased Products EXPO '94 -- "Expanding Industrial Uses and Markets for Agricultural and Forestry Materials"	Kansas City, MO	15	20
Hawaii Windpower Workshop - Co-Sponsored by Pacific International Center for High Technology Research (PICHTR)	Honolulu, HI	2	2
5th Annual U.S. Hydrogen Meeting	Washington, DC	23	0
1994 Oil Heat Technology Conference and Workshop	Upton, NY	4	12
Paving the Way for Alternative Fuel Vehicles	Costa Mesa, CA	0	0
DOE geothermal Program Review XII	San Francisco, CA	8	2
Science and Technology of Superconducting Films	Breckenridge, CA	3	20
1994 ICP National Conference	Scottsdale, AR	16	3
10th World Hydrogen Energy Conference	Cocoa Beach, FL	0	0
The First International Conference on Advanced Oxidation	London, Ontario, Canada	0	0

Superconductivity Program Annual Peer Review	Alexandria, VA	9	26
Workshop on Thermophotovoltaic Converters, Systems, and Application (TPV)	Copper Mountain, CO	7	10
1994 PV Performance and Reliability Workshop	Golden, CO	45	0
1994 NREL/RETSIE - Renewable Energy Conference "Partners in Commercialization"	Golden, CO	20	20
Sandia Photovoltaic Systems Workshop	Albuquerque, NM	4	30
DOE Property Protection Conference	Beckenridge, CO	10	2
Gordon Conference on the Science of Adhesion	Kingston, RI	0	3
SWANA's 32nd International Solid Waste Exposition	San Antonio, TX	14	8
Fourth Workshop on the Role of Point Defects/Defect Complexes in Silicon Device Fabrication	Vail, CO	0	22

HUMAN RESOURCE AND ADMINISTRATION
SCHEDULE C EMPLOYEES

Mr. Myers. Please provide the number of schedule "C" employees by organization and compare this number with fiscal year 1994.

General Durham. The Department currently has 77 Permanent Schedule C employees, an increase of 11 over the number onboard as of the end of FY 1994. (The information follows:)

NUMBER OF PERMANENT SCHEDULE C EMPLOYEES
ON BOARD AS OF SEPTEMBER 30, 1994

ORGANIZATION	NUMBER
Secretary of Energy	9
Congressional and Intergovernmental Affairs	6
Chief Financial Officer	1
Defense Programs	1
Energy Efficiency and Renewable Energy	9
Environment Safety and Health	1
Energy Information Administration	1
Environmental Management	10
Energy Research	2
Science Education and Technical Information	1
Fossil Energy	2
Field Management	1
General Counsel	4
Human Resources and Administration	6
Nuclear Energy	1
Nonproliferation and National Security	2
Public Affairs	2
Policy	5
Civilian Radioactive Waste Management	2
	66

NUMBER OF PERMANENT SCHEDULE C EMPLOYEES ON BOARD AS OF MARCH 9, 1995

ORGANIZATION	NUMBER
Secretary of Energy	8
Congressional and Intergovernmental Affairs	5
Chief Financial Officer	1
Defense Programs	1
Economic Impact and Diversity	2
Energy Efficiency and Renewable Energy	9
Environment, Safety and Health	1
Energy Information Administration	1
Environmental Management	13
Energy Research	3
Science Education and Technical Information	1
Fossil Energy	2
Field Management	2
General Counsel	4
Human Resources and Administration	8
Nuclear Energy	2
Nonproliferation and National Security	2
Public Affairs	3
Policy	8
Civilian Radioactive Waste Management	1
	77

HUMAN RESOURCES AND ADMINISTRATION
RAMSPECK ACT

Mr. Myers. How many employees were hired by the Department of Energy under the authority of the Ramspeck Act in fiscal years 1993, 1994, and 1995?

General Durham. The number of employees hired by the Department under the authority of the Ramspeck Act for fiscal years 1993, 1994, and 1995 to date is:

Fiscal Year	Number
1993	2
1994	4
1995	7 to date

HUMAN RESOURCES AND ADMINISTRATION
TRAINING

Mr. Myers. Describe the Energy Technical Training Center program. Is it in operation?

General Durham. The Energy Technical Training Center, which is operational, is a facility to support all Department wide training activities and a vital part of the Office of Training and Human Resource Development and the Departmental training infrastructure. Its goals are to provide and coordinate high quality, cost effective training; coordinate education and learning resources throughout the Department and external organizations; identify and introduce advanced training technologies; provide training assistance to Departmental Field activities; and be a repository for a wide range of training and educational materials useful to enhancing the competence of the Department's staff. A multifunctional facility is under renovation in Albuquerque, New Mexico to enable the Department to reach these objectives.

Mr. Myers. What is the cost of this program in fiscal year 1994, 1995, and 1996?

General Durham. The cost of operating in fiscal year 1994 was $1.1 million. The cost for fiscal year 1995 is estimated at $0.6 million, and the cost for fiscal year 1996 is estimated at $1.0 million.

Mr. Myers. How many federal and contractor employees are associated with this program?

General Durham. Staffing for this program consists of one Federal and one contractor employee.

Mr. Myers. How many classes have been held and how many people attended?

General Durham. By the end of April 1995, 12 classes will have been conducted with 300 students attending.

Mr. Myers. How will this program be impacted if Kirtland Air Force Base is closed?

General Durham. The Center will not be impacted if and when Kirtland Air Force Base is closed as services provided by the Air Force are readily available from other sources.

Mr. Myers. Describe the Scientific and Engineering Training and Development program including cost in fiscal years 1994, 1995, and 1996. How is the previous program coordinated with the Energy Technical Training Center program which is separately funded?

General Durham. The Scientific and Engineering Training and Development program and the Energy Technical Training Center are not separately funded. The Energy Technical Training Center is an integral part of the Scientific and Engineering Training and Development program which provides facilities and capabilities to enable the Department to implement the program in the most cost effective manner.

The Office of Training and Human Resource Development manages a variety of department-wide cross-cutting programs that provide and/or coordinate the design, development, and delivery of a wide range of training courses in support of the training and developmental activities of the Department's scientific and technical mission. It is aimed at developing and maintaining a well-trained and technically competent workforce. The program currently provides a series of DOE Technical Fundamentals courses, Fundamentals for DOE Operations, Technical Standards and other Scientific and Technical training programs in support of the Department's Technical Excellence Policy. The Scientific and Technical program oversees the Energy Technical Training Center planning, construction, and operations. The program also supports the response to the recommendations on technical qualifications and training made by the Defense Nuclear Facilities Safety Board.

In addition to the Energy Technical Training Center costs, Scientific and Engineering training funding from Departmental Administration totaled $2.6 million for fiscal year 1994, $1.7 million for fiscal year 1995, and $1.3 million for fiscal year 1996.

Mr. Myers. Describe all training programs administered by your office. What was the cost of each in fiscal years 1994, 1995, and 1996 and how many FTEs were associated with each?

General Durham. In addition to the Scientific and Engineering program, we centrally manage the Career and Professional Skills Program. The Professional Skills program provides design, development and delivery of Project Management, Program Management, Procurement and Assistance, Financial Management and various interdisciplinary courses to the professional and technical workforce. The Career Development programs include participation in government wide programs such as the Executive Potential Program and the Women's Executive Leadership Program and the design and development of the Department wide career system.

The Career and Professional Skills Program utilized 20 FTEs and $1.9 million in fiscal year 1994, 20 FTEs and $1.3 million in fiscal year 1995, and 19 FTEs and $1.4 million in fiscal year 1996. These figures do not include the expenditures from Scientific and Engineering training provided earlier.

Mr. Myers. What additional training programs are administered by other DOE organizations and what was the cost in each fiscal year?

General Durham. All Departmental organizations are responsible for insuring that their employees have the training necessary to perform effectively in their positions. To accomplish this, organizations utilize a combination of the cross-cutting training offered by the Office of Training and Human Resource Development and locally developed and delivered training to meet site and program specific needs. It is estimated that programs are spending $35 - $40 million per year for program specific training.

FY 1996 BUDGET LEGISLATIVE PROPOSALS

Mr. Myers. Please describe all proposals contained in the fiscal year 1996 budget which will require legislation to implement. Has the request for legislation been submitted to the appropriate authorizing committees?

Mr. Nordhaus. The following proposals require legislation to implement:

- Privatization of the Naval Petroleum Reserves
- Sale of the Alaska Power Administration
- Privatization of the Southwestern Power Administration, Southeastern Power Administration, and Western Area Power Administration
- Sale of 7 million barrels of oil from the Weeks Island facility of the Strategic Petroleum Reserve
- Provision for the Civilian Radioactive Waste Management Program to use the net proceeds from the sale of the United States Enrichment Corporation as direct spending for the Program
- Clarification of authority for Federal agencies to contract with private power developers to share benefits of cogeneration retrofits

The proposal on the Civilian Radioactive Waste Management Program was introduced in the House as H.R. 1174. It has been sent to the President of the Senate but not yet been introduced there. The proposal on cogeneration has been submitted to the Speaker of the House and the President of the Senate but has not yet been introduced.

SETTLEMENT OF LAWSUITS

Mr. Myers. Are there any lawsuits currently outstanding at DOE facilities which may be settled in the next two years and which could require DOE funds for substantial settlements?

Mr. Nordhaus. Settlements in lawsuits where the Department has been sued directly generally would be paid out of the Permanent Indefinite Appropriation (Judgment Fund), rather than by DOE funds. In contrast, settlements in lawsuits that are brought against DOE contractors generally will be treated as allowable costs under DOE's contracts and, thus, ultimately paid by DOE funds. Although it is likely that a number of currently outstanding lawsuits involving DOE facilities, both against the Department directly and against DOE contractors, will be settled in the next two years, there are no pending settlement negoti-ations in any case which would require substantial DOE funds. However, under the settlement agreed to last year in the Fernald workers class action case, the second of two $10 million payments will be made in October 1995.

AUTHORIZATION OF APPROPRIATIONS

Mr. Myers. Are Department of Energy activities included in the Energy and Water Development appropriations bill considered to be unauthorized if they lack an annual authorization of appropriations? Please provide the legal basis for your conclusion.

Mr. Nordhaus. We do not believe the Department of Energy activities included in the Energy and Water Development appropriations bill are unauthorized. A determination whether, absent an annual authorization, these activities are "considered to be unauthorized" begins with consideration of the House rules pertaining to appropriation bills. House Rule XXI(2)(a) provides that "[n]o appropriation shall be reported in any general appropriation bill. . . for any expenditure not previously authorized by law, except to continue appropriations for public works and objects which are already in progress." Brown, Constitution, Jefferson's Manual, and Rules of the House of Representatives of the United States, H. Doc. No. 405, 102d Cong., 2d Sess. 615 (1992) (hereinafter cited as Jefferson's Manual). Although the interpretation and application of the House rules is a purely internal matter for the House of Representatives, and we do not presume to make judgments about such matters, the following represents our legal analysis to date on whether a point of order on the basis of House Rule XXI might be sustained against the Department's Energy and Water Development appropriation.

The text of Rule XXI(2)(a) itself strongly suggests that appropriations for activities authorized by permanent law qualify as having been "authorized by law." The rule contains no limitation or qualifier in its text indicating that the authorization "law" must be annual or recurring. Common sense suggests that when the Congress has by law commanded that a particular activity should occur, with or without express temporal or dollar limitation, the policy objective of the rule "to prevent delay of appropriation bills because of contention over propositions of legislation" has been fully met. Jefferson's Manual at 617.

The precedents under Rule XXI(2)(a) support the conclusion that general statutory authorization of program activities provides sufficient authority to shield appropriations for such activities from a point of order under Rule XXI(2)(a). See Jefferson's Manual at 622-623. General grants of statutory authority, including those contained in organic acts, constitute sufficient authorization to support appropriations where the general statute does not explicitly require specific or annual authorizations. Id. at 623. For example, it has been ruled that a general authorization to conduct an educational grant program was sufficient to meet the requirement. 124 Cong. Rec. 16778
(June 8, 1978).

Thus, the question whether particular activities supported by the Department's Energy and Water Development appropriation are "unauthorized" within the context of House Rule XXI(2)(a) would turn on whether the original statutory authority for those activities contains an explicit requirement for annual authorization. A review of recent Energy and Water Development appropriations acts indicates that the statutory object of a majority of the appropriations is carrying out the Department of Energy Organization Act, 42 U.S.C. 7101, et seq. (the DOE Act). Section 660 of the DOE Act, 42 U.S.C. 7270, provides that "[a]ppropriations to carry out the provisions of this Act shall be subject to annual authorization."[1] Jefferson's Manual does not discuss any precedents under House Rule XXI(2)(a) that consider section 660 of the DOE Organization Act.

Points of order have been sustained based on some other statutory provisions requiring specific authorization for activities of an agency. See Jefferson's Manual at 623. For example, points of order were sustained against appropriations for the Department of Justice on the basis of a statutory limitation in the 1976 Crime Control Act. That statutory provision was unambiguous in its breadth and its objective to supplant permanent law as authorization for appropriations:

> No sums shall be deemed to be authorized to be appropriated for any fiscal year beginning on or after October 1, 1978, for the Department of Justice (including any bureau, agency, or other similar subdivision thereof) except as specifically authorized by Act of Congress with respect to such fiscal year. Neither the creation of a subdivision in the Department of Justice, nor the authorization of an activity of the Department, any subdivision, or officer thereof, shall be deemed in itself to be an authorization of appropriations for the Department of Justice, such subdivision, or activity, with respect to any fiscal year beginning on or after October 1, 1978.

Pub. L. No. 94-503, sec. 204. Points of order also have been sustained against appropriations for the Federal Trade Commission based on statutory language that "[f]or fiscal years ending after 1977, there may be appropriated to carry out [the Federal Trade Commission's] functions, powers, and duties, only such sums as the Congress may hereafter authorize by law." 88 Stat. 2203 sec. 207 (repealed 1980).

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[1] Certain of the other statutes administered by the Department contain provisions similar to sec. 660. See, sec. 111 of the Energy Reorganization Act (42 U.S.C. 5821), sec. 261 of the Atomic Energy Act (42 U.S.C. 2017), and sec. 16 of the Federal Nonnuclear Energy Research and Development Act of 1974 (42 U.S.C. 5915).

Both these statutory limitations explicitly foreclose reliance on prior existing permanent law as sufficient authorization for appropriations, thus seeming to require future enactments of authority. The DOE Act provision is not so restrictive. In contrast to the Crime Control Act, for example, Congress in section 660 did not use the phrase "[n]o sums shall be deemed to be authorized to be appropriated . . . except as specifically authorized." The statutory text of section 660 does not by its terms supplant existing permanent law as authority that might be cited for subsequent appropriations, or indicate that future legislative enactments would be required to afford such authority. Instead the text of section 660 suggests only a statutory reservation of an option for the Congress, through legislation that might be reported by the various[2] committees having jurisdiction over parts of the Department's activities, to frame appropriations on an annual basis. The legislative history of § 660 seems consistent with this view of its intended effect.[3]

Thus the Department has since the late 1970's construed the terms "shall be subject to annual authorization" in § 660 to mean only that the appropriation in any year is susceptible to a point of order if it exceeds the level of any annual authorization that already has been enacted into law at the time the appropriation item is being considered by the House. I believe that is the correct construction of the provision. Note that Congress has not enacted a civilian authorization bill for the DOE's activities since 1981.

Finally, we would note that House Rule XXI has no impact on the validity of an appropriation once it is enacted into law, regardless of whether a successful point of order might have been made during its consideration by Congress. There is no constitutional requirement that an appropriation act be preceded by a specific authorization. General Accounting Office, Principles of Federal Appropriations Law at 2-34 (1991). In the absence of authorizing legislation, the appropriation itself, in effect, carries its own authorization. Id. at 2-57. "An authorization act is basically a directive to the Congress itself which Congress is free to follow or alter (up or down) in the subsequent appropriation act. A statutory requirement for prior authorization is also essentially a congressional mandate to itself. Thus, for example, if Congress appropriates money to the Defense Department in violation of 10

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[2] According to a report by the House Committee on Committees, in 1980, shortly after enactment of the DOE Act, 83 committees and subcommittees claimed jurisdiction over energy issues in the House alone.

[3] The conference-adopted provision was that which previously had been adopted by the House, which had been described in the House committee report as providing generally for annual authorizations for the Department's contemplated activities, as opposed to the provisions of the Senate-passed bill that arguably would have foreclosed many of the Department's activities from the possibility of any annual authorization scrutiny whatsoever. Compare S. Rep. No. 164, 95th Cong. 1st Sess. (1977) with H. R. Rep. No. 346, 95th Cong. 1st Sess. (1977), in which the former would have included a "such sums" authorization for all Departmental programs except those conducted under several enumerated statutes, and the latter which made all Departmental programs "subject to" the overlay of any annual authorizations.

U.S.C. § 114 [requiring specific authorizations for certain appropriations], there are no practical consequences. The appropriation is just as valid, and just as available for obligation, as if section 114 had been satisfied or did not exist."[4] Id. at 2-35.

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[4] Note, however, that Congress has in at least one circumstance imposed statutory limitations that appear to extend to the ability of an agency to obligate appropriated funds where there is no corresponding annual authorization of appropriations. See 22 U.S.C. 2680(a)(1) (limiting obligation or expenditure of funds appropriated to the State Department either without current authorization or in excess of currently authorized amounts).

LITIGATION COSTS

Mr. Myers. Please provide a listing of litigation costs incurred by each DOE contractor in fiscal years 1993, 1994, and to date in 1995.

Mr. Nordhaus. Beginning in June 1994 for the six class action cases and October 1994 for all other cases in litigation, the Department began to collect quarterly contractor legal costs data. Before this time, however, the cost data was not routinely tracked by the Department and thus complete dollar totals for the 93,94 or 95 fiscal years are not available. Notwithstanding these qualifications, set forth in Appendix A are the figures compiled to date based on existing information along with an explanation of how they were compiled.

In May 1993, the Department's Contract Reform Subgroup on Contractor Litigation and Outside Counsel Fees surveyed Chief Counsel offices to determine legal fees paid by the Department for FY 92 and FY 93 (through May 31, 1993). They reported their findings by site, but not by contractor.

In March 1994, my office issued litigation management procedures and in June 1994, my office requested all Chief Counsel and Field offices to provide quarterly cost reports for all class action cases. The initial focus was on the class actions because a significant portion of legal fees paid by the Department were incurred in these cases. In October 1994, the report was expanded to include all litigation cases in which the Department reimbursed contractor legal costs.

The cost information was compiled by case and reported costs approved in the quarter for reimbursement by the Department. The most recent quarterly report assembled according to these guidelines was issued in January 1995 and is Appendix C to this testimony. Case costs approved in prior years or quarters were reported as one lump sum in the initial October 1994 cost report. Consequently, since the cost report did not require reporting offices to break out costs incurred in FY 93, FY 93 litigation costs were annualized based on information gathered in 1993 for the Subgroup's Report.

The next quarterly cost report is due form Chief Counsel and Field offices on April 15, 1995. My office anticipant that the second quarter FY 95 report will provide more complete and reliable cost data. Once the report is complete, a copy will be forwarded to your office. Additionally, the Office of Genera Counsel is developing a software program that will record and report more detailed information regarding contractor legal fees, including date incurred and contractor name, allowing the Department to monitor and report costs better.

Total Legal Costs by Fiscal Year

FY 92	$31,200,000
FY 93	$35,550,000[1] (annualized)
FY 94	$17,553,372 [2]
FY 95	$ 5,396,085 [3] (through the first quarter of the fiscal year)

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[1] The annualized total for FY 93 was derived from the May 31, 1993 number.

[2] Total costs for FY 94 are not final. Chief counsel and field offices have been asked to report costs incurred in FY 94 so that the Department will have a baseline year against which to compare future annual costs. However, time lags of six to eight months can exist between when a law firm incurred a cost and when a bill is finally forwarded to DOE for review and approval, meaning some costs incurred in FY 94 have not yet been approved and reported.

[3] The FY 95 total costs to-date for legal fees would include approved costs incurred in FY 94 and perhaps, FY 95.

INCREASE IN FULL-TIME EQUIVALENTS

Mr. Myers. Please describe how your caseload has increased enough to justify an increase of 28 new positions (from 153 to 181 FTEs) since FY 1994.

Mr. Nordhaus. Overall staffing levels for the General Counsel's office for the FY 1994 - 1996 period are as follows: 211 for FY 1994, 223 for FY 1995, and 213 for FY 1996. However, FTE's funded out of the Energy and Water Development appropriation have increased over that period, reflecting a shift in Office of General Counsel workload and personnel from enforcement of oil overcharge cases (funded by the Interior and Related Agency appropriation) to other areas, including contractor litigation management, procurement, and environmental compliance.

Oversight hearings in 1993 and 1994 pointed out the necessity for more hands-on management of litigation against the Department's contractors, particularly class actions. Until recently, the Department's management and operating contracts have required the Department to reimburse contractors for litigation costs, settlements, and judgments in suits brought against them. The annual cost to the Department of defending theses cases in recent years has significantly exceeded the entire General Counsel budget. In FY 1992, we reimbursed contractors for over $30 million in attorney's fees. Additional resources have been employed to provide oversight of this pending litigation and to set up an audit program to ensure that the millions of dollars reimbursed by the Department for contractor legal expenses is reasonable and necessary. Our preliminary estimates indicate that these initiatives already have resulted in significant reductions in litigation costs, and we believe continued devotion of resources will result in substantial savings to the Government.

This office is taking a more active role in a wide array of administrative litigation affecting the Department, including Equal Employment Opportunity claims, whistleblower cases, personnel security matters and bid protests. An Office of Dispute Resolution has been established within the Office of General Counsel to support increased use by all programs of the Department of mechanisms to resolve disputes without resorting to litigation. Besides being required by the Administrative Dispute Resolution Act, increased use of Alternative Dispute Resolution can be extremely cost-effective for the Department and avoids delays in initiatives caused by protracted litigation.

The Office of General Counsel has been, and will continue to be, providing a great deal of assistance to the Department's rulemaking and related activities. The Office has the job of simplifying and making the Department's rules less burdensome, and has a major role in the Department's effort to reduce the burden on our contractors of the Department of Energy Order system. In addition, this office has recently been assigned responsibility for the rulemaking support function for the entire Department, consolidating in one office functions that previously had been spread throughout the Department.

The Department also has expanded the scope of its participation in state and Federal regulatory proceedings beyond those in which it merely has a financial interest to include proceedings in which the Department or Administration have a policy interest, such as the California proposal to restructure the electric utility industry.

In the area of procurement law, the office has played an active role on the Secretary's Contract Reform Team, and assisted in the development of guidelines to implement contract reform initiatives. These reform efforts require either recompetition or renegotiation of major contracts, thereby requiring extensive legal involvement in negotiating, drafting, interpreting and implementing required contract clauses.

Another area which will require increased resources within the Office of General Counsel is the Department's Environmental Management program, particularly because of the need to renegotiate CERCLA/RCRA compliance agreements to reflect the lower budget targets for FY 1997 - 2000. The Department currently has 71 existing compliance agreements, and is negotiating 12 additional compliance agreements and over 40 Compliance Orders for mixed waste under the Federal Facilities Compliance Act. The agreements affect more than two dozen states. Planned improvements to the Department's process for handling Freedom of Information Act requests also will require increased legal resources, in order to ensure proper review of Departmental determination to release or withhold documents.

The workload increases described above are significant. However, as part of Secretary O'Leary's 1993 reorganization of the Department, the Economic Regulatory Administration (ERA), which is funded under the Interior and Related Agency appropriation, became part of the Office of General Counsel. As the Department concludes the oil overcharge enforcement activities previously carried out by ERA, the remaining staff of that organization have been used, in lieu of outside hiring, to help offset the increasing needs of the rest of General Counsel. Thus, when FTE's funded under both the Energy and Water Development and the Interior appropriations are considered, total Office of General Counsel FTE requirements actually have decreased from FY 1995 levels.

CONTRACT REFORM

Mr. Myers. What is the status of the Department's Contract Reform initiative?

General Durham Subsequent to issuance of the Contract Reform Team's Report, "Making Contracting Work Better and Cost Less", in February 1994, much has been accomplished under the Contract Reform initiative The Department's Contract Reform Initiative is being vigorously implemented, and has shown results in terms of cost-efficiency, cost reduction, greater contractor accountability, increased competition, greater use of incentive fees and fixed-price arrangements, and potential expansion of the contractor community Fundamental changes in the way the Department does business continue to occur.

The following initial actions have been taken in contract reform:

> The February 1994 Report of the Contract Reform Team contained 48 specific recommendations for streamlining Department of Energy (DOE) contracts and for making them more cost-effective. These recommendations are being implemented on schedule
>
> A senior-level Contract Reform Executive Committee, chaired by the Deputy Secretary, was established on March 15, 1994 to formulate the goals and objectives of Contract Reform and to oversee their timely implementation in the Department.
>
> A Contract Reform Project Office under the auspices of the Office of the Deputy Secretary was established in May 1994 to manage, direct, and oversee the day-to-day implementation of Contract Reform.
>
> On July 5, 1994, the normal process of compete/extend decisions was suspended and, in a single action, I made a decision to extend or compete 19 expiring major contracts. This action accelerated the decision process, and the incorporation of contract reform provisions into contracts, by up to 18 months.

Under our commitment to competition, we have done the following:

> On July 5, 1994, it was announced that six major contracts due to expire would be competed. Of these, the three Nevada Test site contracts have been consolidated into one, and a draft solicitation for that contract and for the Savannah River Plant have been developed and provided for stakeholder review.
>
> In addition, a decision was made to compete the contract to operate the Rocky Flats Plant. The solicitation was issued on July 12, 1994, and proposals were received on November 1, 1994. The contract will be principally based on Federal Acquisition Regulations rather than the DOE Management and Operating provisions contained in DEAR. We are currently in the "Best and Final Offer" stage.

Further, the contract for operation of the Idaho National Engineering Laboratory was competitively awarded on August 3, 1994.

On October 5, 1994, the Department published for public comment a policy statement which clearly establishes competition as the Department norm. Comments are being evaluated and will be incorporated as appropriate.

Our early implementation of contract reform initiatives has resulted in:

Ten major contracts have been given conditional extensions. These contracts, valued at $13.5 billion, will be extended only if they incorporate, the full range of contract reform provisions; otherwise, they will be competed. Three of these contracts, for the operation of West Valley facility, for the Waste Isolation Pilot Plant, and the Hanford Site have been executed. The contract negotiations for the operation of Argonne, Brookhaven and Continuous Electron Beam Accelerator Facility are near completion, and the negotiation for the operation of the Kansas City Plan has been initiated.

The Department is participating in the Office of Federal Procurement Policy Pilot Project to implement performance-based support services contracting.

By streamlining the procurement process, we have taken the following actions:

To facilitate common understanding and consistent implementation of Contract Reform, a statement of the Basic Elements of Contract Reform was developed. These elements are being used as a guide for the development of acquisition strategy, and are providing a basis for review and approval of contract actions.

A senior-level Special Contract Reform Review Board was established to provide the timely and consistent Headquarters review, approval, and direction necessitated by the new Contract Reform Initiative. All of the contract actions mentioned above have received Board review and direction.

The Department is aggressively implementing a program to computerize its small purchasing system as mandated by President Clinton. The Department was one of the few agencies to meet the President's first milestone of having initial capability for electronic commerce by September 30, 1994, doing so at two offices. While transaction volumes are now low, volumes will increase in the future. The electronic commerce program is expected to be expanded throughout the Department in FY 1995 and FY 1996.

The cost savings results included:

Savings of $1 billion over the remaining contract period are anticipated under the contract for the operation of Hanford. Savings of $750 million over five years are anticipated under the new contract for the operation of the Idaho National Engineering Laboratory.

Significant additional savings are anticipated as the efficiencies, incentives, and cost reduction programs that are at the core of Contract Reform, take effect over the next few years. The Department is developing a methodology to identify, collect, measure, and report these cost savings.

Through stakeholder involvement:

The Department held, in association with the National Contract Management Association, a Stakeholder Workshop on November 14, 1994. The purpose was to inform the contractor community of the status of the Contract Reform Initiative and receive their feedback.

The Department solicited public comment before issuing the February 1994 Report of the Contract Reform Team. Approximately 35 organizations and individuals provided comments which were considered by the Department prior to finalizing the report.

Innovative contracting concepts have been applied including:

The Department has encouraged the development of new and innovative contracting concepts. A key objective is greater reliance on alternatives to the traditional Management and Operating cost-reimbursement contract. Such alternatives include the Performance-Based Management contract, the General Integrating contract, the Environmental Restoration Management contract, contracts that emphasize increased fixed-price contracting, and other worthy concepts whose goals are improved performance at less cost.

A "model" contract applicable to nonprofit organizations has been developed and is being used as a basis for contract negotiations.

A "model" contract applicable to for-profit organizations has been developed and published for stakeholder review on February 10, 1995 with comments due on March 10, 1995. Comments are being evaluated

On March 2, 1995, the Department published for comment a Notice of Proposed Rulemaking which eliminates the "Federal Norm" as the standard for contractor procurement, and replaces it with best industry practices.

OFFICE OF ECONOMIC IMPACT AND DIVERSITY

HISTORICALLY BLACK COLLEGES AND UNIVERSITIES (HBCUs)

Mr. Myers. Please provide a listing of the Historically Black Colleges and Universities and the amount of funds each received in Fiscal years 1993, 1994, 1995 and estimated for 1996.

Mrs. Moody. The Department awarded $34 million in 1994 and $53 million in 1995 to Historically Black Colleges and Universities. Goals of $75 million and $90 million have been set for Fiscal Years 1995 and 1996, respectively. We are submitting a listing of the HBCUs who received funding in Fiscal Year 1993. We are in the process of compiling the listing for Fiscal Year 1994 and planned funding for 1995, and will provide it to you by April 7, 1995.

TABLE III
FY 1993
FEDERAL AGENCY AWARDS TO INSTITUTIONS

STATE/INSTITUTION	R&D	PE	TRAINING	F&E	FELLOWS	SFA			PS	AI	OTHER	TOTALS
ALABAMA												
ALABAMA A&M	25,000		456,353									481,353
ALABAMA STATE												0
BISHOP STATE COMM.												0
CARVER CAMPUS												0
CONCORDIA COLLEGE												0
FREDD STATE TECH												0
LAWSON STATE												0
MILES COLLEGE												0
OAKWOOD COLLEGE												0
SELMA UNIVERSITY												0
J.F. DRAKE TECH												0
STILLMAN COLLEGE			25,000									25,000
TALLADEGA COLLEGE			89,424									89,424
TRENHOLM STATE TECH												0
TUSKEGEE UNIVERSITY			281,929									281,929
ARKANSAS												
ARKANSAS BAPTIST												0
PHILANDER SMITH												0
SHORTER COLLEGE												0
U. OF ARKANSAS @ PB			19,099		19,000							38,099
DELAWARE												
DELAWARE STATE			89,424	70,715								160,139
DISTRICT OF COLUMBIA												
HOWARD UNIVERSITY	147,000		357,908		2,750	14,225	2,000					523,883
UNIV. OF D. C.			45,000									45,000

CATEGORIES

R&D - RESEARCH & DEVELOPMENT
PE - PROGRAM EVALUATION
TRAINING
F&E - FELLOWSHIP, RECRUITMENT, IPA
SFA - STUDENT FINANCIAL ASSISTANCE
DIS - DIRECT INSTITUTIONAL SUBSIDIES
TPA - THIRD PARTY AWARDEES
PSI - PRIVATE SECTOR INVOLVEMENT
AI - ADMINISTRATIVE INFRASTRUCTURE

STATE/INSTITUTION	R&D	PE	TRAINING	F&E	FELLOWS	SFA			PS	AI	OTHER	TOTALS
FLORIDA												
BETHUNE COOKMAN	8,000			7,500								15,500
EDWARD WATERS												0
FLORIDA A&M			416,247									416,247
FLORIDA MEMORIAL			80,445									80,445
GEORGIA												
ALBANY STATE												0
CLARK ATLANTA U.	84,000		380,248	8,573,615							2,292,805	11,330,668
FORT VALLEY STATE	414,980		329,000		255,000	40,000						1,038,980
INTERDENOMATIONAL THEOLOGICAL CENTER												
MOREHOUSE COLLEGE	106,000		24,000									130,000
MOREHOUSE MEDICAL												0
MORRIS BROWN				8,311								8,311
PAINE COLLEGE												0
SAVANNAH STATE	8,000			13,500	14,200							35,700
SPELMAN COLLEGE												0
KENTUCKY												
KENTUCKY STATE												0
LOUISIANA												
DILLARD UNIVERSITY			19,710		20,000							39,710
GRAMBLING STATE												0
SOUTHERN U. & A&M	153,000		499,693									652,693
SOUTHERN/BATON ROUGE	3,185				25,975							29,160
SOUTHERN/NEW ORLEANS					3,200							3,200
SOUTHERN/SHREVEPORT												0
XAVIER UNIVERSITY	6,931,867		504,694		9,200							7,445,761
MARYLAND												
BOWIE STATE												0
COPPIN STATE												0
MORGAN STATE	471,216		185,445									656,661
U. OF MARYLAND ES					13,070							13,070

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STATE/INSTITUTION	R&D	PE	TRAINING	F&E	FELLOWS	SFA			PS	AI	OTHER	TOTALS
MICHIGAN												
LEWIS COLLEGE OF BUS.												0
MISSISSIPPI												
ALCORN STATE	8,980											8,980
COAHOMA JR. COLLEGE			62,405									62,405
HINDS COMM. COLLEGE												0
JACKSON STATE	1,636,000		404,860		420,488						752,000	3,213,348
MARY HOLMES												0
MISSISSIPPI VALLEY	8,000		25,000	13,500								46,500
RUST COLLEGE												0
TOUGALOO COLLEGE	2,000											2,000
MISSOURI												
HARRIS STOWE STATE												0
LINCOLN UNIVERSITY												0
NORTH CAROLINA												
BARBER-SCOTIA	18,000		18,088									36,088
BENNETT COLLEGE												0
ELIZABETH CITY STATE	800			13,500								14,300
FAYETTEVILLE STATE												0
JOHNSON C. SMITH												0
LIVINGSTONE COLLEGE												0
N. C. A&T STATE	659,586		281,929		128,400	59,737	9,000				322,000	1,460,652
N. C. CENTRAL				40,000	22,500							62,500
ST. AUGUSTINE												0
SHAW UNIVERSITY												0
WINSTON-SALEM STATE			100,000									100,000
OHIO												
CENTRAL STATE												0
WILBERFORCE UNIV.												0
OKLAHOMA												
LANGSTON UNIV.												0

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STATE/INSTITUTION	R&D	PE	TRAINING	F&E	FELLOWS	SFA			PS	AI	*OTHER	TOTALS
PENNSYLVANIA												
CHEYNEY UNIV.												0
LINCOLN UNIV.			100,000		3,250	8,000	2,000					113,250
SOUTH CAROLINA												
ALLEN UNIVERSITY												0
BENEDICT COLLEGE												0
CLAFLIN COLLEGE												0
CLINTON JR. COLLEGE												0
DENMARK TECH.												0
MORRIS COLLEGE												0
S. C. STATE UNIV.	192,000		319,816	7,500								519,316
VOORHEES COLLEGE												0
TENNESSEE												
FISK UNIV.	196,000											196,000
KNOXVILLE COLLEGE												0
MORRISTOWN CAMPUS												0
LANE COLLEGE	19,000		19,281									38,281
LEMOYNE-OWEN												0
MEHARRY MEDICAL	173,000											173,000
TENNESSEE STATE	375,000		80,445		2,650	9,250	3,000					470,345
TEXAS												
HUSTON-TILLOTSON												0
JARVIS CHRISTIAN												0
PAUL QUINN COLLEGE												0
PRAIRIE VIEW A&M	853,185		412,374		12,975						251,000	1,529,534
SAINT PHILLIP'S												0
SOUTHWESTERN CHRIST.												0
TEXAS COLLEGE												0
TEXAS SOUTHERN	25,000		281,929									306,929
WILEY COLLEGE												0

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STATE/INSTITUTION	R&D	PE	TRAINING	F&E	FELLOWS	SFA			PS	AI	*OTHER	TOTALS
VIRGINIA												
HAMPTON UNIV.	581,000		509,668								205,000	1,295,668
NORFOLK STATE	73,185		25,000									98,185
SAINT PAUL'S												0
VIRGINIA STATE	489,000											489,000
VIRGINIA UNION												0
WEST VIRGINIA												
BLUEFIELD STATE	8,000			7,500								15,500
W. VIRGINIA STATE												0
U.S. VIRGIN ISLANDS												
UNIV. OF THE V. I.												0
GRAND TOTAL	13,669,984	0	6,444,414	8,755,641	952,658	131,212	16,000	0	0	0	3,822,805	33,792,714

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PSI - PRIVATE SECTOR INVOLVEMENT
AI - ADMINISTRATIVE INFRASTRUCTURE

CIVIL RIGHTS

Mr. Myers. How many complaints or cases are currently pending before the Civil Rights Division? How many were handled in Fiscal years 1993 and 1994?

Mrs. Moody. As of March 3, 1995, 196 active cases are pending. During Fiscal Year 94, the Office of Civil Rights processed 171 cases. During Fiscal Year 93, the Office of Civil Rights processed 148 cases.

SMALL BUSINESS

Mr. Myers. How many companies have been on the Department's small disadvantaged business preference list for five years?

Mrs. Moody. The Department does not maintain a "small disadvantaged business preference list." However, the Department does maintain a small business sources list. Procurement is highly decentralized at the Department with each procuring activity maintaining its own source system. This enables contracting activities to examine potential sources in arriving at solicitation determinations.

Mr. Myers. How many contracts and of what size were awarded to small businesses in Fiscal Years 1993, 1994 and 1995?

Mrs. Moody. In Fiscal Year 1993, there were 1,120 contract obligations ranging in size from 10 thousand to 31 million, in Fiscal Year 1994, 1,180 contract obligations from 10 thousand to over 19 million, and since the beginning of Fiscal Year 1995, 45 contract obligations. I am submitting a list of the Department's top 100 small business contractors for Fiscal Year 1993 and Fiscal Year 1994. However, the number of contracts does not include the Department's management and operating contractor numbers as they are only required to report obligations and not the number of contracts awarded.

Mr. Myers. Has the Department evaluated the effectiveness of this program to determine how many businesses helped with the program have successfully graduated?

Mrs. Moody. The Department is not advised as to the graduation dates in the Small Business Administration's (SBA) 8(a) portfolio. We understand that the SBA does follow the growth and failure rates of graduated 8(a) firms.

c. TOP 100 SMALL BUSINESS CONTRACTORS

The top 100 small business contractors are arranged in descending order by amount of procurement obligations to each contractor during FY 1993. The top twenty-seven (27) of these are also included in the listing of DOE's top 100 contractors.

TOP 100 SMALL BUSINESS CONTRACTORS

CONTRACTOR NAME	NUMBER OF CONTRACTS	FY 1993 NET OBLIGATIONS ($000)
1. MSE Inc.	1	$ 31,662
2. Advanced Sciences Inc.	7	29,678
3. Analysas Corp.	4	22,042
4. PAI Corp.	10	13,460
5. Systematic Management Services	13	11,789
6. Energy Research Corp.	4	9,594
7. M-C Power Corp.	1	9,409
8. Maitland Bros.	1	9,366
9. Scientech Inc.*	8	7,011
10. High Power Inc.	4	6,680
11. Am Pro Protective Agency Inc.*	2	6,597
12. Tresp Assoc. Inc.	10	6,026
13. Research Mgmt. Consultants Inc.	5	5,964
14. META Inc.	6	5,846
15. Labat-Anderson Inc.	1	5,797
16. Technology & Management Services	4	5,685
17. Tucker & Associates Inc.	1	5,391
18. Government Micro Resources	23	5,085
19. Energetics Inc.*	5	5,036
20. Source One Management Inc.	4	4,889
21. Comprehensive Technology Intl. Inc.	1	4,865
22. TRI-O Inc.	1	4,654
23. Power Contracting Inc.	4	4,561
24. SE Inc.	3	4,523
25. Response Analysis Corp.	4	4,299
26. R. J. Miranda Corp.	1	4,128
27. SRA Technologies Inc.	4	4,025
28. RECOM Technologies Inc.	3	3,992
29. Digital Systems Research	1	3,900
30. Internet Systems Inc.	1	3,830
31. Ralph G. Moore & Associates	2	3,657
32. ADC Ltd.	6	3,418
33. Princeton Economic Res. Inc.	5	3,408
34. ASTA Engineering Inc.	5	3,390
35. M.H. Chew & Associate	1	3,259
36. World Computer Systems Inc.	1	3,250
37. Vista Technology Inc.	1	3,201
38. LAM Associates Inc.	6	3,032
39. Enterprise Advisory Services	4	3,003
40. Dominion Construction Co.	1	2,859
41. Fernandez & Associates	3	2,859
42. Branco Enterprises Inc.	1	2,849

* Does not match the number of contracts and FY 1993 obligations provided in the top 100 contractors list because this firm became a large business during FY 1993.

TOP 100 SMALL BUSINESS CONTRACTORS (CONTINUED)

CONTRACTOR NAME	NUMBER OF CONTRACTS	FY 1993 NET OBLIGATIONS ($000)
43. Kira Inc.	4	$ 2,783
44. Nuclear Filter Technology Inc.	6	2,776
45. International Data Prod. Corp.	6	2,723
46. Jupiter Corp.	4	2,708
47. ENI Inc.	1	2,623
48. Washington Consulting Group.	2	2,613
49. Salazar Assoc. International Inc.	2	2,566
50. Decision Analysis Corp. of Virginia	2	2,561
51. NYMA Corp.	1	2,412
52. Peddada Consultants Inc.	3	2,359
53. Tri-Cor Industries Inc.	1	2,349
54. Eagle Research Group Inc.	2	2,307
55. Modern Technologies Corp.	1	2,295
56. Brink Electric Construction Co.	4	2,259
57. Continental Shelf Associates Inc.	1	2,255
58. Columbia Services Group Inc.	3	2,255
59. NEOS Corp.	3	2,246
60. BNF Tech. Inc.	1	2,240
61. H-Power Corp.	1	2,065
62. MEC Construction Inc.	4	2,061
63. New Bedford Panoramex Corp.	12	2,056
64. Jerry R. Bergeson & Associates	1	2,012
65. DC Information Systems Inc.	1	1,996
66. Addison Construction Co.	6	1,808
67. A. & C. Bldg. & Ind. Maint. Corp.	1	1,757
68. Energy International Inc.	2	1,735
69. Lundberg Marshall & Associates	3	1,728
70. Vortec Corp.	1	1,715
71. Eaton Operating Co. Inc.	1	1,704
72. Elmwood Office Park	1	1,702
73. Facilities Management Co.	6	1,668
74. East Tennessee Mech. Contractor	4	1,656
75. Contractors Four Inc.	3	1,653
76. University Systems Inc.	6	1,591
77. Inca Construction Co. Inc.	8	1,584
78. John James Estes & Associates	3	1,551
79. KPI Corp.	10	1,550
80. Pacific Western Technologies	2	1,540
81. Sidhu Assoc. Inc.	1	1,537
82. Robert E. Rivera Construction. Co.	3	1,505
83. Eng. Comp. Opteconomics Inc.	1	1,500
84. KOH Systems Inc.	3	1,491
85. Dynamic Concepts Inc.	1	1,461
86. Wilkins Systems Inc.	8	1,433
87. Aguirre Engineers Inc.	1	1,416
88. NJG Inc.	1	1,413
89. Morrison Construction Services Inc.	2	1,364
90. Proteus Corp.	7	1,352

TOP 100 SMALL BUSINESS CONTRACTORS (CONTINUED)

CONTRACTOR NAME	NUMBER OF CONTRACTS	FY 1993 NET OBLIGATIONS ($000)
91. Walcoff & Associates	2	$ 1,350
92. Sociotechnical Research Appl.	7	1,340
93. Mehta Tech. Inc.	2	1,302
94. Schweitzer Engineering Lab.	2	1,301
95. Exter Associates Inc.	3	1,284
96. Lee Associates	3	1,283
97. Jason Associates	2	1,265
98. R. & R. International Inc.	1	1,250
99. Comsis Corp.	1	1,212
100. Sioux Contractors Inc.	1	1,210

c. TOP 100 SMALL BUSINESS CONTRACTORS

The top 100 small business contractors are arranged in descending order by amount of procurement obligations to each contractor during FY 1994. The top twenty-nine (29) of these are also included in the listing of DOE's top 100 contractors.

TOP 100 SMALL BUSINESS CONTRACTORS

CONTRACTOR NAME	NUMBER OF CONTRACTS	FY 1994 OBLIGATIONS ($000)
1. Analysas Corp.	4	$ 19,810
2. Scientech Inc.	9	14,127
3. MSE Inc.	1	13,900
4. M-C Power Corp.	1	13,082
5. Systematic Management Services	20	12,128
6. Energy Research Corp.	2	11,878
7. PAI Corp.	14	11,498
8. High Power Inc.	2	10,576
9. Molten Metal Technology Inc.	1	9,233
10. Enterprise Advisory Services	7	7,918
11. SRA Technologies Inc.	3	7,460
12. Source One Management Inc.	4	7,327
13. Protective Door Industries	2	7,247
14. Tresp Assoc. Inc.	9	6,528
15. Addison Construction Co.	7	6,202
16. Princeton Economic Res. Inc.	4	5,483
17. Comprehensive Technologies Intl. Inc.	1	5,385
18. Abacus Technology Corp.	2	5,324
19. Technology & Management Services	4	4,813
20. Advanced Sciences Inc. *	3	4,813
21. Tucker & Associates Inc.	1	4,809
22. Jupiter Corp.	6	4,566
23. McCarthy Construction	1	4,479
24. Facilities Management Co.	5	4,307
25. Hague International	2	3,958
26. Internet Systems Inc.	1	3,904
27. RECOM Technologies Inc.	2	3,833
28. Vortec Corp.	2	3,781
29. Labat-Anderson Inc.	1	3,762
30. Government Micro Resources	18	3,641
31. M.H. Chew & Associate	2	3,542
32. Response Analysis Corp.	1	3,292
33. LAM Associates Inc.	5	3,235
34. World Computer Systems Inc.	1	3,233
35. Ralph G. Moore & Associates	2	3,142
36. Jerry R. Bergeson & Associates	1	3,097
37. Columbia Services Group Inc.	2	3,075
38. Eng. Comp. Opteconomics Inc.	1	3,000
39. Naughton Energy Corp.	1	2,995
40. Energetics Inc.	5	2,903
41. Jason Associates Corp.	1	2,900
42. Puma Construction Co.	7	2,707
43. Bio-Imaging Research Inc.	1	2,661
44. Peddada Consultants Inc.	2	2,652
45. Walcoff & Associates	7	2,632
46. Dulles Networking Assoc. Inc.	2	2,590
47. Systems Flow Inc.	1	2,586
48. Decision Analysis Corp. of VA.	1	2,567
49. TC Enterprises Inc.	10	2,510
50. International Data Prod. Corp.	6	2,510

TOP 100 SMALL BUSINESS CONTRACTORS (Continued)

	CONTRACTOR NAME	NUMBER OF CONTRACTS	FY 1994 OBLIGATIONS ($000)
51.	PB Inc.	1	$ 2,507
52.	B. & S. Transport Inc.	1	2,500
53.	Greenbar Corp.	14	2,492
54.	Digital Systems Research	1	2,450
55.	ADC Ltd.	2	4,426
56.	H-Power Corp.	1	2,401
57.	American Technologies Inc.	2	2,295
58.	Aguirre Engineers Inc.	9	2,273
59.	Tri-Cor Industries Inc.	1	2,261
60.	American Line Builders Inc.	1	2,244
61.	Scott & Sons Maintenance Inc.	1	2,174
62.	Westar Corp.	1	2,160
63.	Camber Corp.	2	2,151
64.	Robert E. Rivera Construction Co.	9	2,150
65.	Vista Technology Inc.	2	2,140
66.	Alfa-Laval Separation	6	2,100
67.	Capstone Corp.	1	2,100
68.	ECS Technologies Inc.	13	2,039
69.	Salazar Assoc. International Inc.	2	1,978
70.	S. Powell Construction Co. Inc.	7	1,974
71.	Research Mgmt. Consultants Inc.	4	1,965
72.	KPI Corp.	12	1,951
73.	Dynamic Decisions Inc.	22	1,919
74.	Modern Technologies Corp.	1	1,886
75.	AM Pro Protective Agency Inc. *	1	1,878
76.	System Technology Associates	2	1,870
77.	Engineering Services Group PC	1	1,815
78.	META Inc.	4	1,800
79.	NEOS Corp.	3	1,788
80.	ENI Inc.	1	1,763
81.	Proteus Corp.	2	1,734
82.	Advanced Systems Tech. Inc.	2	1,710
83.	Gram Inc.	2	1,700
84.	Kira Inc.	3	1,684
85.	Kenrob & Associates Inc.	1	1,590
86.	CCS Laboratories Inc.	5	1,570
87.	MEC Construction Inc.	5	1,548
88.	Gonzales Consulting Services Inc.	1	1,544
89.	Space Power Inc.	1	1,529
90.	Pacific Western Technologies	1	1,455
91.	Sociotechnical Research Appl.	2	1,447
92.	Hazardous & Medical Waste Svc.	2	1,437
93.	Nuclear Filter Technology Inc.	9	1,432
94.	Elmwood Office Park	1	1,429
95.	Research Planning Inc.	2	1,394
96.	Cadmus	1	1,330
97.	Lundberg Marshall & Associates	1	1,329
98.	Tri-Ark Industries Inc.	1	1,329
99.	Inca Construction Co. Inc.	4	1,277
100.	Coopers & Lybrand	2	1,222

* Does not match the number of contracts and FY 1994 obligations provided in the top 100 contracts list because this firm became a large business in FY 1994 or earlier.

ENVIRONMENTAL JUSTICE

Mr. Myers. Please describe exactly the duties of the 4 new FTE's requested in support of environmental justice in the minority community. How will the activities of these employees differ from the environmental justice activities being proposed for employees of the Environmental Management program?

Mrs. Moody. The duties of the 4 new FTE's requested for environmental justice (EJ) are multi-purpose and include coordination of the Department's EJ program and implementation of our strategy across all Departmental elements, representation of the Department on the Federal inter-agency subcommittee; co-chairing and participating on the task forces; developing and issuing guidance and criteria to Departmental organizations to maintain consistency in impact analyses, assessments, and characterization of relevant factors and definitions, etc.; and coordination of the Department's assessments and mitigation plans with State and local authorities.

These duties differ from the EJ activities being proposed by the Environmental Management (EM) program because EM's staff will concentrate on EM's specific EJ strategies only, as required by the other program offices. The FTEs' requested by ED will have responsibilities for a cross-agency and inter-agency coordinating and liaison role in order to maintain a viable EJ program at the Department.

POLICY

Mr. Myers. How much was spent on foreign travel within the Department, including contractors, in fiscal years 1994 and 1995?

Ms. Tierney. At present, we have information on the cost of DOE-sponsored foreign travel for calendar year 1994. Data for fiscal year 1994 can and will be developed and provided in a few days. Data for fiscal year 1995 are not yet available.

In calendar year 1994, our records show that $27,761,000 was spent on official foreign travel undertaken by all Department of Energy Federal, Laboratory, and Contractor personnel. Of this amount, $23,300,000 was spent on foreign travel by DOE Laboratory and Contractor personnel, and $4,461,000 was spent on foreign travel by Federal employees. The Policy Office as a whole, spent approximately $630,000 on foreign travel in calendar year 1994.

Mr. Myers. Provide a brief synopsis of major energy development programs outside the United States. What are the comparable spending levels with DOE's programs?

Ms. Tierney. The only source of comparable data for energy R&D expenditures is published annually by the International Energy Agency (IEA), containing information for IEA member countries. The latest report was published in June of 1994, and it contains comparable data on energy R&D expenditures for the year 1993.

In 1993, for the energy R&D categories tracked by the IEA, Japan spent more on energy R&D than the United States ($5.03 billion U.S. dollars vs $2.36 billion). Together, Japan and the United States accounted for nearly 78% of all IEA member countries' expenditures on energy R&D.

As a share of Gross Domestic Product (GDP), energy R&D expenditures per dollar of GDP including nuclear research, were higher than those of the United States in eight countries (Canada, Japan, Finland, France, Netherlands, Norway, Sweden and Switzerland). If nuclear research is excluded, energy R&D expenditures per unit of GDP were still higher than those of the United States in five countries (Denmark, Finland, Netherlands, Norway and Switzerland). Relative or comparative levels of expenditures on energy R&D are not an indication of the appropriateness of these expenditures for a given country.

In absolute terms, the United States spent more than any other IEA member country in 1993 on energy R&D for conservation, oil and gas, and new and renewables. In energy R&D expenditures for coal, fusion, and electricity, Japan outspent the U.S. in 1993, and both France and Japan outspent the U.S. in energy R&D on both conventional and advanced nuclear power systems in that year.

The relevant tables from the IEA's annual report will be made available to the committee under separate cover.

Mr. Myers. Describe the need for a DOE post in Paris, Moscow and Tokyo. What is the staffing and total cost of each post? Are there other international offices?

Ms. Tierney. DOE has one on-site staff person at the American Embassy in Tokyo and one at the U.S. Mission to the Organization for Economic Cooperation and Development (OECD) in Paris. Recently DOE received State Department approval to open an office in Moscow, with one DOE employee. In each case, the Department has determined that the costs of the overseas office are outweighed by the benefits of increased coordination, better knowledge of the host country or organization, and reduced travel costs.

On-site representation in Tokyo supports the significant amount of science and nuclear technology cooperation between DOE and the Government of Japan. The DOE representative facilitates the communication between DOE and Japanese agencies. The office provides liaison services between the DOE science and technology program offices in monitoring and implementing science and technology agreements, and assists in efforts to increase the export of U.S. energy equipment to Japan. Approximate annual cost to support the office is $450,000.

The DOE representative in Paris is assigned to the Office of the Science Counselor as the Science Advisor for Energy in the U.S. Mission to the Organization for Economic Cooperation and Development. The DOE representative supports DOE's technology and science activities at the International Energy Agency, the Organization for Economic Cooperation and Development and the Nuclear Energy Agency. At the Nuclear Energy Agency, the DOE representative also supports the Nuclear Regulatory Commission's activities. These organizations have a broad range of technology and science activities underway that are of keen interest to the Department as it implements the international dimension of the Administration's technology policy. Approximate annual cost to support the office is $250,000.

DOE has experienced a rapid increase in its New Independent States (NIS) activities as a result of policy initiatives put forth by the Gore-Chernomyrdin Commission and the initiation of programs such as the NIS Industrial Partnering Program and the Nuclear Reactor Safety Program. Through these types of initiatives, the Department is playing a major role in achieving U.S. foreign policy objectives. To assist the Department of Energy in overseeing these activities and to improve coordination with the Department of State and the U.S. Embassy in Moscow, DOE is in the process of establishing an office in Moscow. Approximate annual cost to support the office is $200,000.

The DOE on-site staff person at the U.S. Mission to International Organizations in Vienna (UNVIE) supports DOE programs concerning nuclear nonproliferation policy implementation. In the capacity as Mission Science Officer, the DOE representative advises the Ambassador. She is responsible for policy issues covering areas of strengthening IAEA safeguards, U.S. staff at the IAEA, IAEA technical assistance and cooperation, coordination of assistance from IAEA Member States to the Former Soviet Union, IAEA safeguards on excess special nuclear material under the U.S./IAEA Safeguards Agreement, assistance to the

IAEA under the DOE/IAEA cooperation agreement, and country specific issues concerning safeguards in Iraq, North Korea, and the Former Soviet Union. Approximate annual cost to support the office is $200,000, which is funded from the budget of the Office of Nonproliferation and National Security

The DOE representative in Geneva is a permanent member of the U.S. delegation to the Conference on Disarmament (CD) and is assigned to the Ambassador of the U.S. delegation as the Senior Advisor from the Department of Energy. The CD is in the process of negotiating the Comprehensive Test Ban Treaty (CTBT) and is expected to soon take up negotiation of a treaty to ban fissile material production for weapons. The DOE representative's assignment includes coordinating DOE's policy and technical input to the delegation in Geneva, serving as the Ambassador's expert on fissile material cutoff issues, and supervising the DOE office staff which currently consists of a contractor (laboratory) technical advisor and an office manager (local hire). The one DOE representative is on a 3-year, permanent change-of-station assignment. Approximate annual cost to support the office is $250,000, funded from the budget of the Office of Nonproliferation and National Security.

Mr. Myers. Please describe the expanded international science and technology policy programs including staff and funding.

Ms. Tierney. The Department of Energy, in conjunction with other U.S. agencies, has sought to leverage limited resources to expand cooperation in several important energy and environmental areas. By working with international partners, DOE has been able to reduce U.S. outlays, limit the degree of duplication of effort, and continue the undertaking of important long-term and costly energy research and technology development, including fusion research. This activity is undertaken primarily in response to new international concerns with regard to nuclear nonproliferation, nuclear safety assistance, sustainable development, global environmental issues, support for emerging economies in transition, and the health and welfare of the U.S. economy.

Specifically, DOE has expanded cooperation with the Russian Federation and other Newly Independent States (NIS) countries, as well as with several of the Big Emerging Markets (BEMs). Expanded science and technology (S&T) cooperation was initiated with India and Pakistan during the past year, and expansion of such cooperation with China, South Africa and Latin America countries is anticipated in the coming year.

Primary areas of expanded S&T cooperation included: (1) fossil fuels research, including advanced power systems, coal gasification, coal processing, gas research, and reduced emissions; (2) energy efficiency and renewable energy technologies, including photovoltaics, wind, alternative fuels, and basic materials sciences like ceramic engines; 3) environmental technology, including waste management, site remediation, and biotechnology; (4) energy research, including high energy physics and fusion research; and (5) cooperative activities undertaken to promote joint implementation projects to mitigate greenhouse gas emissions.

Most of this additional activity was undertaken by refocusing the existing science and technology resources of the international component of the Policy offices to bring them to bear on emerging priorities and new geographical realities. Many of these new international activities are barely out of the discussion and initiation phase. Our ability to sustain and follow-up on many of these new initiatives will depend in large part on our ability to continue to do more with less, and the ability of our program offices to redirect scarce resources.

The task of coordinating the Department's international energy research and development collaboration activities would be greatly enhanced by the development of better information systems on foreign R&D capabilities and priorities and a database on DOE's agreements and scientific exchanges that support large science projects, fundamental research on energy and matter, and technology transfer and commercialization for science and technology. Work is underway to improve our ability to access information about ongoing international collaboration activities of all DOE programs and facilities, and their costs and benefits to the nation. The development of this kind of database will allow us to engage in strategic, performance-based management of our international R&D and collaboration efforts.

Mr. Myers. Please provide the amounts of oil imports into the United States for each year since 1978. What is the forecast for the year 2000 and 2020?

Ms. Tierney. Gross oil imports, crude and product, in millions of barrels per day, since 1978 are the following:

1978	8.36 MMBPD	1987	6.68 MMBPD
1979	8.46	1988	7.40
1980	6.91	1989	8.06
1981	6.00	1990	8.02
1982	5.11	1991	7.63
1983	5.05	1992	7.89
1984	5.44	1993	8.62
1985	5.07	1994	8.93
1986	6.22		

The Energy Information Administration forecast does not go out to 2020. Its last forecasted year is 2010. Gross oil imports, crude and product, in millions of barrels per day are the following:

2000 11.43 MMBPD	2010 13.00 MMBPD

Mr. Myers. Is reducing dependence on foreign oil imports still a major tenet of the Department's energy strategy? How can you explain the Department's lack of success in reducing foreign oil imports?

Ms. Tierney. Reducing dependence on foreign oil imports is still a major goal of the Administration and the Department. Since oil imports are the difference between what we consume and what we produce, the Department's objectives include both slowing the rise in U.S. oil consumption and arresting the fall in domestic oil production. Both will reduce the rate of growth of import demand.

The elements of DOE's plan to reduce import demand include increasing investment in energy efficiency, transportation vehicles and alternative fuels, technology, natural gas utilization, and renewables.

We are taking measurable steps to promote greater domestic production of energy resources -- actions that will enhance America's domestic competitiveness and provide encouragement to the domestic energy industry.

We have aligned our budgetary priorities with essential national goals: satisfying the nation's energy needs, reducing our vulnerability to oil shocks, protecting the environment, and improving the economy.

The commitment to those priorities is reflected in the Administration's FY 1996 budget and represents the best use of taxpayer dollars. We have shifted money from less-effective programs in order to enhance energy efficiency and drive renewable technologies into the marketplace, while also advancing the cause of natural gas, oil and coal.

One of the initiatives proposed by the Administration that will help domestic producers is the export of Alaska North Slope crude oil. The DOE evaluated this issue thoroughly during the last year and found removal of the export ban likely to create additional employment, raise royalty collection for the Federal government and revenues for the States of Alaska and California, and lift domestic production by roughly 100,000 barrels per day.

We are increasing our investment in energy efficiency because new and emerging energy efficiency technologies increase the productivity and competitiveness of our businesses, prevent pollution and reduce other environmental damages, create new U.S.

industries and jobs, and help reduce oil imports. The Department operates a balanced portfolio of energy efficiency programs designed to create and commercialize new efficiency technologies in the buildings, utilities and industrial sectors. The modest 13 percent increase in the Department's energy efficiency budget request for FY 1996 will mean $20 billion in benefits over the next five years and will enable the Administration to carry through on its commitment to a stronger economy, a cleaner environment, and a more secure future.

The Administration places particular emphasis on changing transportation energy patterns because oil accounts for 97 percent of transportation's total energy use. We must develop vehicles with radically improved fuel economy and we must develop and use cost-competitive, domestic and clean transportation fuels. In FY 1996, the Federal government will fund partnerships with private industry, partnerships which have been structured to accelerate these developments.

The Administration has doubled its investment with American industry since 1992 in advanced technologies for the exploration and production of natural gas and oil. New technology significantly decreased the domestic finding and production costs for natural gas and oil and maintains and expands the domestic resource base. The oil programs will contribute toward increasing the recovery of the discovered resource by 4 to 7 billion barrels and increased production by 600,000 to 900,000 barrels per day in 2010. Through the natural gas supply R&D program, we will work with industry to lower exploration and production costs $290 million per year and contribute toward adding up to 2 trillion cubic feet per year of new gas production by the year 2010.

The United States has an abundance of renewable energy resources that can, over time, help reduce our dependence on imported oil. During the last 15 years, intensive work by industry and the Department of Energy's national laboratories has steadily increased the reliability of renewable energy systems while dramatically lowering their costs. These systems are gradually becoming commercially competitive with conventional power sources. Within the next two decades, renewable energy resources can begin reducing our oil imports when used as a substitute for refined products, for powering a growing segment of the U.S. transportation sector, and for heating and cooling our homes and offices.

Today, wind generated electricity is nearly competitive with conventional electric power; the U.S. has regained its lead in world photovoltaic shipments; the electric heat pump industry is striving for 12 percent of the U.S. space conditioning market; the bioenergy industry is working to become a major new source of electric power and a major new source of income for America's farmers; and hydrogen energy is being developed as a major energy carrier for the future.

Importantly, the Administration is reducing the red tape and regulations to improve the competitiveness of our domestic natural gas and oil industry.

In addition, to respond to oil supply disruptions, we have an extensive network of agreements with other countries through the International Energy Agency. Coordinated action on stock release policy and demand restraint is much more effective than any one country acting alone. DOE maintains the Strategic Petroleum Reserve and keeps sharp emergency response teams to help the Administration and the Congress manage any sudden energy crisis.

Finally, to reduce the likelihood of price spikes, DOE is trying to boost non-OPEC production around the globe by working with host countries to accept U.S. companies and technologies.

Although imports have increased in recent years due to increased consumption and reduced domestic production, which are largely the result of lower prices compared with the early 1970s, Americans are now using one-third less energy to produce each dollar of gross domestic production--a direct result of energy efficiency measures. This translates into direct savings in oil imports. For example, in transportation, we are now using 3 million barrels per day less oil than we would have were it not for the gains in fuel efficiency for automobiles and light duty trucks. Our imports would be at least 3 million barrels per day higher, and probably more, were it not for these efficiency gains, a clear indication that our policies are having a significant impact in reducing oil imports. Our present policies will continue to build upon this record.

Mr. Myers. Please explain why your FTEs have increased from 161 in fiscal year 1994 to the fiscal year 1996 request of 195. The Department's portfolio of programs and special issues is changing and it would appear that the resources the policy office allocates to various activities should be shifted in concert with programmatic realignments rather than requesting new resources.

Ms. Tierney. The FY 1996 level of 195 FTEs is down one from the FY 1995 level. Of the difference between the FY 1996 level of 195 FTEs and the 1994 level of 161, 25 FTEs were transferred with the Environmental Analysis programs from the Energy Supply, Research and Development Appropriation in the FY 1995 appropriation. These 25 FTEs have remained constant for several years despite growing activity in the environmental issues area. Three additional FTEs reflect the transfer of the space function from Energy Research to Policy, where the incumbents have taken on additional science-related policy functions. The remaining increase of six FTEs is associated with increased activity in the overall Departmental program analysis and evaluation programs, in support of cross-cutting science and technology policy and analysis, Environmental Management and National Security Policy, and an expanded energy export promotion effort. In last year's reorganization, Policy was asked to take on a broader policy coordination role, in addition to the traditional energy policy and international energy functions previously performed. To the extent possible, we tried to accomplish these additional responsibilities within existing FTE levels because we knew the pressure on the Department to reduce staffing. However, it was necessary to request a minimal increment in FY 1995 to accomplish many of the tasks associated with these new areas. This increase was accommodated within the Department's overall FTE ceiling, reflecting a Department-wide shift in concert with realigned priorities.

Mr. Myers. How will the policy office "Ensure completion of ES&H high priority activities by the end of FY96," and why is this a function of the policy office when the Department has a separate office of environment, safety and health?

Ms. Tierney. The direct responsibility to ensure completion of ES&H high priority activities is led by the Office of Environment, Safety And Health. As part of an Agency Environment, Safety and Health Performance Effort, the Policy Office, along with the Chief Financial Officer, has agreed to help ensure that these activities are accomplished through the DOE Budget and Planning Process. The actual completion of these activities is the responsibility of each DOE Program Office. As a cross-cutting effort, the Offices of Policy, Environment, Safety & Health and Chief Financial Officer have agreed to mutually ensure the funding for and completion of these important, high priority Environment, Safety & Health projects as a key driver to support the Secretary's Environment, Safety & Health Initiative.

OFFICE OF CONGRESSIONAL AND INTERGOVERNMENTAL AFFAIRS

CONGRESSIONAL LIAISON REPRESENTATION

Mr. Myers. Please explain why it is necessary to have multiple Congressional Affairs representatives attending meetings with Congressional staff and members. How do you intend to deploy these resources more efficiently in the future?

Mr. Taylor. It is the policy of the Department as well as the Office of Congressional and Intergovernmental Affairs (the "Office") to efficiently deploy staff resources. The Office is particularly sensitive to ensuring that meetings with members of Congress and congressional staff are appropriately staffed. In the case of attendance by members of this Office, we are of the view that in most cases it is only necessary for one person to participate in such meetings. We have every confidence that this view is, in fact, Office practice with some exceptions that in the past, as might be expected, were not always justified. On occasion, however, the attendance of more than one representative from this Office may have been appropriate because the meeting involved the discussion of issues that cross-cut the Department's programs and/or included representatives from different programs that were not within the expertise of one person in this Office. In each case, our goal is to ensure that our participation is limited to representatives from this Office who add value to meetings based on their demonstrated knowledge and understanding of the issues to be discussed.

Last month I pointedly raised this issue during a staff meeting to reinforce the need to supervisors and staff professionals alike that we must make business like decisions about who and how many of our staff participate in congressional meetings. In short, the Office is to provide only those resources that are reasonably necessary to accomplish the purposes of a meeting. In addition, I will provide written guidance to our staff to ensure that this Office does not "overstaff" congressional meetings as well as hearings. I have requested that all supervisors and team leaders, including myself, actively monitor staff participation as a part of our ongoing effort to deploy staff resources in the most efficient manner.

CONGRESSIONAL AND INTERGOVERNMENTAL AFFAIRS

TRAVEL EXPENSES

Mr. Myers. What was the total amount spent on travel for this office in fiscal years 1993, 1994, and estimated for 1995? For each year, identify the amounts funded in Departmental Administration and the amounts funded out of other DOE program office accounts.

Mr. Taylor. Other than local travel, travel expenses of the Office of Congressional and Intergovernmental Affairs are incurred for three reasons:

- Accompanying Members of Congress and staff to Department sites for oversight, authorization, and appropriation/budget estimate purposes;
- Meeting Congressional interest in the Environmental Management function which shows the largest amount of programmatic travel expenses. This travel is associated primarily with the compliance and oversight functions related to restoration activities at former weapons sites; and
- Working with the large number of Congressional Committees and Subcommittees (fifteen full Committees and twenty-four Subcommittees) with jurisdiction over our physical complex and programs.

The increase between FY 1993 and FY 1994 was due to the Administration change. There was a period of transition during this time; however, FY 1994 saw an increased pace of travel because of new leadership and direction. Additionally, the Environmental Management program experienced a transfer of numerous facilities from weapons production to environmental restoration. These are activities which garnered significant Congressional and Intergovernmental attention.

The travel expenses within the jurisdiction of the Energy and Water Development appropriations for fiscal years 1993, 1994, and 1995 are included in the table below which I would like inserted for the record:

TRAVEL BY DOE ORGANIZATIONS

	FY 1993	FY 1994	FY 1995 Estimated
Congressional and Intergovernmental Affairs	$ 45,986	$ 67,344	$ 62,000
Economic Impact and Diversity	-0-	1,026	-0-
General Counsel	-0-	51	160
Policy, Planning and Program Evaluation	-0-	9,106	-0-
Secretary	218	3,126	- 0-
Subtotal, Departmental Administration	$ 46,204	$ 80,653	$ 62,160
Civilian Radioactive Waste Management	2,873	6,486	6,000
Defense Programs	-0-	1,328	1,000
Environment, Safety, and Health	1,362	5,045	6,000
Environmental Management	2,959	15,981	12,000
Renewable Energy	753	1,404	1,200
Energy Research	122	1,224	-0-
Field Management	-0-	775	-0-
Nuclear Energy	-0-	108	-0-
Subtotal, Program Office Funding	$ 8,069	$32,351	$26,200
Total Travel Expenditures/Estimates	$ 54,273	$113,004	$88,360

CONGRESSIONAL AND INTERGOVERNMENTAL AFFAIRS

LIAISON ASSIGNMENT TO PROGRAM ORGANIZATION

Mr. Myers. Please identify how many employees of your office are assigned as liaison to each DOE program organization.

Mr. Taylor. The Office of Congressional and Intergovernmental Affairs is comprised of eight areas: The Office of the Assistant Secretary, the Offices of the Deputy Assistant Secretaries for House and Senate Liaison, Office of Research and Analysis, Office of Resource Management, Office of Hearings Coordination, Office of Intergovernmental Affairs and Office of Governmental Liaison.

The Office of Governmental Liaison is managed by a Director and Deputy Director who crosscut all issues areas with the liaison staff responsible for program specific representation before Congress. The liaisons, who are organized in a matrix fashion to match the level of activities, interests, and budget, represent the programs before fifteen full Committees and twenty-four Subcommittees in the House of Representatives and Senate. These Committees and Subcommittees include appropriation, authorization, and oversight functions.

The current staffing and organization is represented in the table below, which I would like to insert for the record.

OFFICE OF GOVERNMENTAL LIAISON

STAFFING LEVEL	PROGRAMS/ISSUES
3	**Nuclear Energy, Energy Research, Office of Policy (including International Energy Policy), and Technology Partnerships & Economic Competitiveness**
3	**Fossil, Energy Information Administration, Hearings & Appeals, and Economic Regulatory Administration (Office of General Counsel)**
4	**Energy Efficiency, Environment, Safety & Health, and Power Marketing Administrations**
3 1	**Human Resources & Administration, Field Management, Economic Impact and Diversity, Science Education & Technical Information, and Chief Financial Officer/budget** (Assistant to a liaison with a disability)
3	**Defense, Nonproliferation & National Security, and Fissile Materials Disposition**
6	**Environmental Management, Civilian Radioactive Waste Management, and Worker & Facility Transition (Defense Conversion)**

SIZE OF PUBLIC AFFAIRS AT EACH SITE

Mr. Myers. What is the size of the public affairs office maintained by site by each DOE contractor? (In your analysis, please describe what criteria are used by each contractor to defined the public affairs function to ensure that the information from each contractor is compatible.)

Mr. Gauldin. The following list of DOE locations and respective contractors is shown in a table which I would like to insert in the record. Note that in some instances, small activity offices are spread across a wide physical area. Contractors define the public affairs function in the broadest sense; that is, activities which relate to communications across the spectrum of all available "publics" -- advocacy groups, business leaders, representatives and students of schools, professional organizations, internal company employees, elected officials, reporters, and the general public. The functions performed by public affairs people must, therefore, range across a similarly all-encompassing arena. This work includes: public participation activities as required by NEPA and CERCLA, site specific advisory boards, tours, public reading rooms, visitors centers, economic development groups, educational outreach projects, internal newsletters and meetings, publications review, presentation and photo support, emergency response information, media inquiries, public inquiries, and speech writing. Since all offices are configured the same, these numbers do not include various museum staffs or Freedom of Information Act administrators.

Mr. Myers. What is the size of the public affairs office maintained by each DOE operations, field, area, site or support office outside of Washington?

Mr. Gauldin. The Public Affairs offices maintained by each field office are shown in a table (closes estimate to date) which I would like to insert in the record.

SIZE OF PUBLIC AFFAIRS OFFICE AT EACH SITE

(for the record)

Albuquerque		
Carlsbad area	36	
Dayton	1	
Grand Junction	2	
Kansas City	1	(counted just media relations)
Los Alamos	19	
Mound	2	
Pantex	22	
Pinellas	3	
Sandia	14	
UMTRA Project	6	
Chicago		
Ames Lab	7	
Argonne Lab	14	
Brookhaven Lab	14	
Fermi Lab	5	
Princeton Lab	1	
Fernald		
FERMCO	1	
Golden		
Nat'l Energy Lab	9	
Idaho		
EG&G	18	
Westinghouse	5	
PTI	2	
Neveda		
EG&G	5	
Raytheon	2	
Reynolds	1	
Oak Ridge		
American Museum	1	
CEBAF	2	
FUSRAP (40 sites)	6	
Martin Marietta	43	(multiple locations)
Oak Ridge Institute	17	
Weldon Springs	4	
Oakland		
Energy Tech Center	1	
Lawrence Berkeley	6	
Lawrence Livermore	15	
Stanford Accelerator	2	

Richland	
Environmental Health Foundation	1
Kaiser	3
Pacific Northwest Lab	11
Westinghouse	29
Rocky Flats	
EG&G	32
Savannah River	
Savannah River Ecology Lab	1
Wackenhut	2
Westinghouse	35

SIZE OF PUBLIC AFFAIRS OFFICE AT EACH DOE FIELD OFFICE

(for the record)

Albuquerque	11	(does not include museum staff)
Chicago	5	
Fernald	3	
Golden	2	
Idaho	8	
Nevada	6	
Oak Ridge	5	
Oakland	3	
Richland	8	
Rocky Flats	12	
Savannah River	9	(includes 2 Forest Service people)

BOARD OF CONTRACT APPEALS

Mr. Myers. Please provide a case load analysis of the Board of Contract Appeals for FY 1994, FY 1995 and FY 1996.

Judge Van Doren. In FY 1994, the dockets of the Board of Contract Appeals and its associated boards totaled 47 cases. We estimate the FY 1995 docket will be 65 cases and the FY 1996 docket will be 76 cases. A breakdown of the case load is as follows:

CASE LOAD ANALYSIS

	FY 1994	FY 1995*	FY 1996*
BOARD OF CONTRACT APPEALS			
(a) Cases pending (Oct. 1)	22	27	32
(b) Cases filed	19	25	25
(c) Cases disposed	14	20	25
FINANCIAL ASSISTANCE APPEALS BOARD			
(a) Pending (Oct. 1)	1	2	2
(b) Filed	1	2	3
(c) Disposed	0	2	4
CONTRACT ADJUSTMENT BOARD	1	0	0
PATENT COMPENSATION BOARD	0	0	0
INVENTION LICENSING APPEALS BOARD	2	2	0
OTHER ACTIVITY			
(a) Environmental Hearings	0	0	0
(b) Debt Collection	0	0	0
(c) Debarment Hearings	-	2	4
(d) Alternative Dispute Resolution (ADR) Neutral Services	1	5	10

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* Estimated

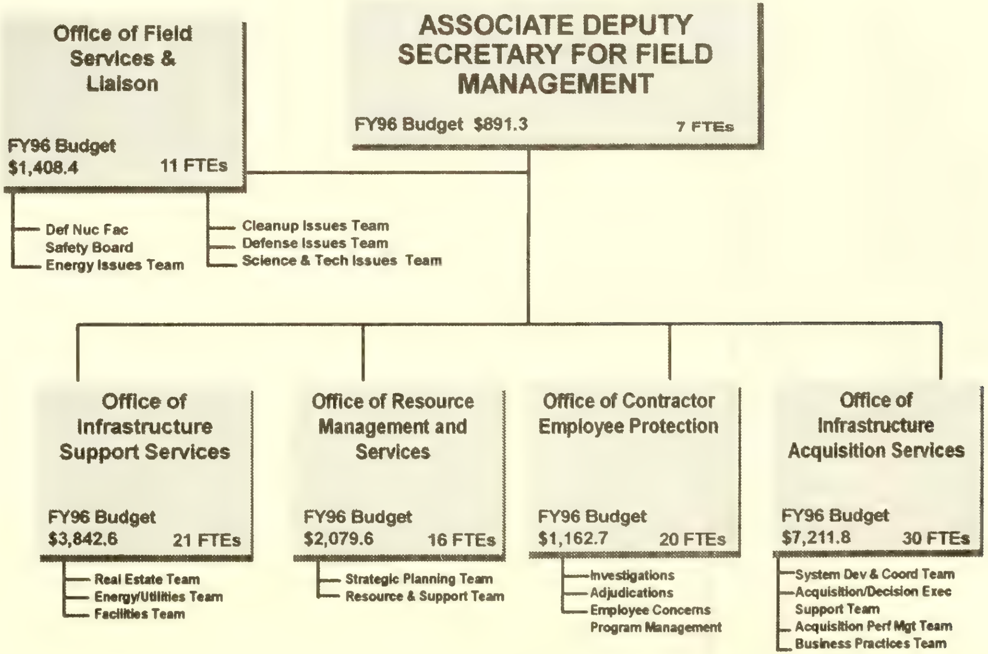
FIELD MANAGEMENT
FISCAL YEAR 1996 BUDGET REQUEST
DEPARTMENTAL ADMINISTRATION
FIELD MANAGEMENT ORGANIZATION

Mr. Myers. Please provide an organizational chart including FTEs and funding for each element in the field management organization.

Mr. Pearman. Attached is the organizational chart including FTEs and funding for the Field Management organization.

ASSOCIATE DEPUTY SECRETARY FOR FIELD MANAGEMENT

($ in Millions)



FIELD MANAGEMENT
FISCAL YEAR 1996 BUDGET REQUEST
DEPARTMENTAL ADMINISTRATION
ENVIRONMENTAL MANAGEMENT FTEs

Mr. Myers. Why is your office requesting an increase of 7 FTEs to support environmental management activities? What services does your office perform with the field that are different than those performed by numerous employees in Environmental Management and other headquarters' offices?

Mr. Pearman. The increase is based upon the continuing growth in Environmental Management activities. These include: the transfer of responsibility for Rocky Flats and Ohio Field Offices; assistance in improving both the project management system for Environmental Management and the quality of its project managers; facility transition concerns; and assistance in contract reform, indirect cost reduction, and field/Headquarters relations. While EM focuses on the development of technology and processes to accomplish waste remediation and environmental restoration, Field Management identifies, raises and assists in the resolution and process improvement of project management and control and facility transition, interim maintenance, property disposition and contract employee concerns across all DOE programs and field sites.

FIELD MANAGEMENT
FISCAL YEAR 1996 BUDGET REQUEST
DEPARTMENTAL ADMINISTRATION
FTE INCREASES

Mr Myers. Why are the FTEs increasing from 88 in fiscal year 1994 to 105 in fiscal year 1996?

Mr. Pearman. Field Management closed out FY1994 with an onboard count of 88. In FY1995, Field Management's allocation increased by 10, supporting increased Indepednt Cost Estimating and Facilities Management activities. In 1996, the allocation is 105, reflecting the addition of 6 FTEs for the Employee Concerns Program and 7 FTEs to support Environmental Management activities. Six FTEs were transfered to the Office of Energy Efficiency and Renewable Energy to support the In-House Energy Management program.

FIELD MANAGEMENT
FISCAL YEAR 1996 BUDGET REQUEST
DEPARTMENTAL ADMINISTRATION
EMPLOYEE CONCERNS

Mr Myers. Describe the need for an Office of Employee Concerns. Please describe the duties and how it will differ from function performed by Human Resources and Administration or the personnel offices at each field office. What is the staffing and funding level for this office?

Mr. Pearman. The ultimate goal of the Enhanced Employee Concerns Program is to foster a climate of open communication among employees, both Federal and contractor, and their management in order to resolve problems at an early stage and create an environment where employees feel free to express their concerns without fear of reprisal. This includes enhancing open communication, assuring "zero tolerance for reprisals," and implementing total quality management initiatives, as employees and management address mutual concerns in the normal course of doing business.

At the present time, field administration and personnel offices do not actively attempt to resolve the full range of employee concerns and are sometimes reluctant to seek resolution of issues perceived to be related solely to internal contractor practices.

The Enhanced Employee Concerns Program is not intended to replace existing programs; rather it is intended to establish a mechanism to receive a full spectrum of workplace concerns by Federal and contractor employees, assure that these concerns are reviewed, referred or investigated, and that originators of concerns are provided with responses.

In implementing the program, the cognizant Secretarial Officer, or Field or Operations Office Manager, will determine whether existing programs or mechanisms should be consolidated with a single point of contact. The determination whether to consolidate existing programs or establish a new one will be made by these officials.

The number of staff needed to implement the Enhanced Employee Concerns Program must be determined by each organization based on the method of implementation, program requirements, and existing staff who now deal with these types of concerns. In some cases, it may be effective for an existing employee to handle the workload as a collateral duty. In other circumstances, some realignment of staff may be necessary to meet program needs.

The Headquarter's Employee Concerns Oversight Office would not be responsible for day-to-day operational activities, but rather will provide assistance, guidance and coordination in the implementation of the Enhanced Employee Concerns Program to Headquarters and field offices. It will be responsible for determining training needs, and developing appropriate training programs to meet those needs. Among other things, it will provide the individual Employee Concerns Managers with information and advice on a wide variety of existing programs that are available to resolve differing types of concerns. The Enhanced Employee Concerns Program staff will be made aware of techniques to facilitate concerns resolution by utilizing the expertise and experience of staff at Headquarters and the local field offices. Training in alternative dispute resolution techniques and options will also be available.

In addition, the Headquarters Employee Concerns Oversight Office will review the activities of the Headquarters and field offices in implementing the Enhanced Employee Concerns Program to assure that programs are operating properly and effectively. If problems are identified, the Oversight Office staff will work with local offices to assure appropriate modifications are implemented.

The Headquarter's Oversight Office has been given a staffing level of 6 FTEs with funding of $423,000 in the FY1996 budget.

FIELD MANAGEMENT
FISCAL YEAR 1996 BUDGET REQUEST
DEPARTMENTAL ADMINISTRATION
CONTRACTOR EMPLOYEE PROTECTION CASES

Mr Myers. How many contractor employee protection cases were initiated and continued in fiscal years 1993, 1994 and 1995? What was the disposition of each case?

Mr. Pearman. The chart that follows identifies case activity by fiscal year, including those cases carried over from the prior fiscal year.

OCEP* CASES INITIATED AND CONTINUED

FISCAL YEAR	COMPLAINTS RECEIVED	CARRIED OVER FROM PRIOR FY	COMPLAINTS CLOSED
1993	41	22	19
1994	48	44	40
1995**	19	52	14

TYPES OF DISPOSITIONS

	1993	1994	1995
Settlements	5	19	6
Dismissals	7	5	4
Withdrawn	4	6	0
OCEP Decisions:	3	10	4
for Complainant (in whole or part)	[2]	[5]	[3]
for Contractor	[1]	[5]	[1]
Total Cases Closed: 73	19	40	14

* Office of Contractor Employee Contractor

** Represents case activity through 3/10/95.

FIELD MANAGEMENT
FISCAL YEAR 1996 BUDGET REQUEST
DEPARTMENTAL ADMINISTRATION
SUPPORT SERVICE

Mr Myers. Provide a detailed breakout of the support services funding in fiscal years 1994, 1995 and 1996 with a brief description of each activity.

Mr Pearman. Support costs are provided for the record (as follows):

FIELD MANAGEMENT
FISCAL YEAR 1996 BUDGET REQUEST
DEPARTMENTAL ADMINISTRATION
SUPPORT SERVICE FUNDING

		Funding	Funding		Associated Full-time Employees			Average Cost Per Employee			Purpose
Program Office	Contract Name	FY 1994	FY 1995	FY 1996	FY 1994	FY 1995	FY 1996	FY 1994	FY 1995	FY 1996	
Field Management	ARINC	$200,000	$300,000	$195,000	1.5	2.5	1.5	$116,400	$120,000	$123,600	Nuclear Weapons Material & Remediation Cost Estimates
Field Management	Burns & Roe	$1,250,000	$670,000	$840,000	12.5	6.5	6.0	$103,077	$103,077	$103,077	Environmental Restoration cost & schedule estimates
Field Management	Exeter	$115,000	$550,000	$550,000	4.5	5.5	5.5	$97,000	$100,000	$103,000	Utility Rate Intervention & Negotiation
Field Management	Foster Wheeler 16	$1,182,000	$670,000	$810,000	11.0	6.5	6.0	$99,985	$103,077	$106,169	Major System Acquisition Independent Cost Estimating
Field Management	Foster Wheeler 17	$1,040,000	$655,000	$850,000	9.5	6.5	6.0	$97,746	$100,769	$103,792	Major Environmental Facilities Construction & Life Cycle Cost Estimating
Field Management	MTM	$196,837	$100,000	$0	2.0	1	0.0	$97,000	$100,000	$103,000	Program Management & Control System Data Systems
Field Management	GSC	$0	$600,000	$550,000	0.0	5	4.5	$116,400	$120,000	$123,600	Cost Estimating Software Tools Set Development & Maintenance
Field Management	BII	$0	$600,000	$700,000	0.0	5	5.5	$116,400	$120,000	$123,600	Cost Estimating Relationship Modeling
Field Management	RMCI	$804,000	$804,000	$804,000	8.5	8.5	8.5	$94,588	$94,588	$94,588	Facilities Maintenance Analysis & Life Cycle Planning
Field Management	PEI	$0	$125,000	$0	0.0	1	0.0	$121,250	$125,000	$128,750	Cost Database Development and Maintenance
Field Management	Symtech	$317,889	$473,720	$428,000	2.0	3	2.5	$153,169	$157,907	$162,644	Program Control System Analysis & Support
	Total	$5,105,726	$5,547,720	$5,727,000	51.5	51.0	46.0	$101,085	$103,701	$106,318	
Field Management	Training	$45,000	$141,000	$141,000							
Field Management	ADP Support	$1,151,000	$1,201,000	$1,226,000							
Field Management	Other	$311,274	$491,280	$501,557							
	Total	$6,613,000	$7,381,000	$7,595,557							

FIELD MANAGEMENT
FISCAL YEAR 1996 BUDGET REQUEST
DEPARTMENTAL ADMINISTRATION
SITE REVIEWS

Mr. Myers Please describe the pilot performance based process centered on a single multi disciplinary yearly site review. What will your office be reviewing that isn't already being reviewed by other internal or external oversight organizations?

Mr. Pearman. The pilot for an annual site review is intended to reduce the oversight burden on the laboratories by orchestrating a single multi disciplinary review once a year. This is to replace the single discipline reviews which have been traditionally conducted by each program and staff offices such as Comptroller, Procurement, Project Management, etc. For the business focus reviews, the Operations Office will schedule, with the laboratory management, a review which will support the business review needs of all headquarters elements. All of the headquarters elements will participate in this single review. Through this single annual review the business management oversight requirements of the laboratory will be satisfied, and the uncoordinated and redundant reviews will be reduced, contributing to the productivity of the laboratory operations and to the more effective use of the diminishing federal resources.

FIELD MANAGEMENT
FISCAL YEAR 1996 BUDGET REQUEST
DEPARTMENTAL ADMINISTRATION
LABORATORY MANAGEMENT RESPONSIBILITIES

Mr. Myers. Last year DOE also had an Office of Laboratory Management. Does that office still exist? If so, how does it differ from yours?

Mr. Pearman. The Office of Laboratory Management continues to be an element of the Office of Energy Research. They principally interface directly with the National Laboratories which conduct the research for that Office. The Office Of The Associate Deputy Secretary for Field Management has as our focus the interface with the DOE Operations Offices to provide a single point for communication and coordination of the activities related to the federal management of the contractors and laboratories to execute the DOE programs.

INSPECTOR GENERAL EMPLOYEES AT FIELD SITES

Mr. Myers. How many Inspector General employees are physically located at which field sites?

Mr. Layton. The number of Inspector General employees located at each site is shown in a table which I would like to insert for the record. The information follows:

LOCATION OF INSPECTOR GENERAL FIELD EMPLOYEES

Field Site	Number of Employees
Capital Regional Office	
Germantown	18
H St.	16
FERC	5
Dallas	3
Pittsburgh	13
Eastern Regional Office	
Chicago	8
Cincinnati	9
New Orleans	7
Oak Ridge	34
Princeton	8
Savannah River	18
Western Regional Office	
Albuquerque	29
Denver	10
Idaho	9
Kansas City	1
Las Vegas	7
Lawrence Livermore	17
Los Alamos	7
Portland	5
Richland	12
Total	236

COORDINATION OF AUDITS

Mr. Myers. Are your audits coordinated with any of the multiple internal and external organizations which oversee DOE activities?

Mr. Layton. The Office of Inspector General publishes an audit plan for each fiscal year pursuant to the requirements of the Office of Management and Budget's Circular A-73. The formal audit plan is the culmination of an extensive audit planning process which includes close coordination and interaction with:

o senior DOE program officials at Headquarters, such as the Assistant Secretaries for Environment, Safety and Health, and Environmental Management and their Operation Offices' counterparts in the field;

o the Chief Financial Officer's Compliance Division;

o Departmental review groups such as those established by the Procurement and Property Review and Evaluation Division of the Department's Office of Contract Management and Administration

o the U.S. General Accounting Office;

o internal audit groups, under the auspices of the Cooperative Audit Strategy, associated with the Department's management and operating contractors; and,

o the Congress and its various oversight boards and committees.

Our objective is to provide the most balanced audit coverage with the least amount of duplication of effort with the resources available to us.

LOCATION AND BENEFITS OF ADDED RESOURCES

Mr. Myers. Since 1991 when your office had 248 FTEs, staffing has increased to 356. Where have the additional resources been added, and can you quantify the additional benefits which have been attained by the increased staff?

Mr. Layton. The increase from 248 FTEs to 356 FTEs is somewhat misleading. Since FY 1991, the audit staff was essentially federalized, replacing many contractor staff-years. The additional FTEs are located primarily at our field sites. The number of sites with an Office of Inspector General presence has increased by five. In addition, we formed an ADP Audit Group. Co-location of audit, investigation and inspection staff with program offices has been a particularly productive placement of resources, saving scarce travel funds and overhead.

Over the last twelve years, since the Grace Commission's report, the Department of Energy has been criticized for providing inadequate audit coverage of our contractors, primarily the Department's management and operating (M&O) contractors. The addition of staff since FY 1991 enabled us to focus additional resources in those areas where the greatest proportion of taxpayer dollars are expended.

In our FY 1991 Semiannual Reports to the Congress, our audit reports had a potential impact of over $200 million. In FY 1994 that figure was over $1 billion.

Since 1991, our Office of Investigations has undergone a series of organizational and management changes aimed at streamlining its operational processes. Investigative efforts have been realigned toward cases of increased complexity with more emphasis on conducting investigations focussed on violations of Federal criminal and civil statutes.

Cases which are referred and accepted for prosecution require the dedication of more staff-hours of labor than those cases which are primarily investigated and closed without prosecutorial involvement. With the number of cases accepted for prosecution more than doubling from FY 1991 to 1994, the increase of 12 FTEs enabled the Office of Investigations to effectively process these more labor-intensive cases, while continuing to address a steadily increasing investigative case load and an increasing number of complaints received from the Hotline.

In FY 1991, the Office of Inspections issued 12 inspection reports. With the gradual increase in staff, we have increased our reports production each year (FY 1992 - 14, FY 1993 - 21). In FY 1994, the Office of Inspections issued 35 reports, for an increase of approximately 200 percent over FY 1991.

In addition during FY 1994, the Office of Inspections was given the responsibility for the IG Management Referral System with no increase in FTEs. This involves preparing referral letters for allegations referred to management and other activities, and evaluating management's response. The Office of Inspections opened 403 matters in FY 1994 under the Management Referral System.

Statement of Hazel R. O'Leary
Secretary of Energy
Department of Energy
Before the
House Committee on Appropriations
Subcommittee on Energy and Water Development

Mr. Chairman and Members of the Subcommittee, I am pleased to appear before you to present the Department of Energy's (DOE) budget for FY 1996. Today marks the beginning of a new chapter in the long collaboration between this Subcommittee and the Department of Energy. Your support and guidance throughout the years have been invaluable and enable me to share with you today, an impressive portfolio of recent accomplishments. In this spirit of bipartisan cooperation, I would like to share our plans for the coming fiscal year and to describe DOE's transition to a smaller, more effective, and more efficient enterprise.

CRITICAL MISSIONS OF THE DEPARTMENT OF ENERGY

We are requesting $16.6 billion in FY 1996, to continue the Department's move away from Cold War requirements to meet the new challenges of global competition. Our budget request allows the Department to continue to meet critical needs of the American people: advancing U.S. leadership in science and technology, safeguarding national security, cleaning up the Cold War environmental legacy, and securing an affordable, sustainable, and productive energy future.

National Security

Despite the end of the Cold War and progress in international arms reduction, there are too many nuclear weapons and too much weapons-grade nuclear material in the world. We are applying the nuclear expertise at our weapons laboratories toward new safeguards against the proliferation of weapons of mass destruction. The international regime working to halt the spread of weapons-grade materials relies to a great extent on the technical knowledge of our nuclear scientists and engineers. No other Federal agency has the scientific and technological proficiency or the facilities to do this job.

Science and Technology

The Department's national laboratories, represent the largest research system of its kind in the world, offering the expertise of 30,000 engineers and scientists that have included 33 Nobel Laureates — to not only safeguard national security, but also to conduct fundamental research in the national interest. Many of the nation's corporations are cutting back, or eliminating entirely, research that advances U.S. technological leadership. Our long-term national investment in fundamental research must not be allowed to fade into history.

Environmental Management

The Department is engaged in the largest environmental cleanup in the nation at DOE's nuclear weapons production sites and supporting facilities. The Department's cleanup inventory includes tons of plutonium in hard-to-control forms, nearly 50 tons of reactor-radiated materials, and enormous quantities of hazardous chemicals. A cleanup effort of this magnitude must be orchestrated carefully. We take very seriously our responsibility to ensure that this cleanup is conducted in a cost-effective manner. We are now assessing the risks that drive the way we set our cleanup priorities.

One of our critical environmental management activities is to resolve the nation's concerns about the permanent disposal of civilian spent nuclear fuel and defense high-level waste. The Department is studying the Yucca Mountain site as a candidate geologic repository. We are pursuing a national solution to nuclear waste management and disposal that will reduce risks to human health and the environment and that may provide more confidence in nuclear power as an energy option.

Energy Resources

As a nation, we are still vulnerable to oil imports. However, we do have flexibility in responding to shocks in the international oil market as supplies from Mexico, Canada, Venezuela and Nigeria have become more secure and we continue to encourage supply in those parts of the work. It is also why we continue to encourage exploration in Russia given its vast reserves of oil and gas and why the nation's Strategic Petroleum Reserve, which could meet seventy days of U.S. oil demand, remains vital. We also continue to push all supply and demand side options into the marketplace in order to not be dependent on any single source. Renewable energy technologies are beginning to gain a foothold in energy markets world-wide, however, our goal of competitive sustainable energy sources requires additional investment. The need to assure the availability of nuclear power as a clean, safe, and efficient source of energy also continues.

DISMANTLEMENT IS NOT THE ANSWER

In recent months, some have suggested that, to save taxpayer dollars, the new Congress should dismantle the Department of Energy. President Clinton gave this idea careful thought. After great consideration, in a January 23, 1995, Business Week interview, Vice-President Gore stated the Administration's position. The Department of Energy has, in the words of Vice President Gore, "...been through the mill, and they've emerged greatly downsized. They succeeded in defining their core missions in a way that demonstrated we're better off with them than without them."

We have outlined a course of downsizing and strategic alignment which I would like to share with you today. From both a budgetary and programmatic perspective, this is the prudent choice. The Department's essential and critical missions must be performed regardless of where they are lodged. Dismantlement by itself will not produce significant budget savings. A program moved to another agency will still require management and administrative support, and inefficiencies from disruption are the likely price. Significant savings can only come from cutting or consolidating programs, privatizing functions and increasing efficiency.

SAVINGS FOR THE AMERICAN TAXPAYERS

Our downsizing and alignment efforts are only the next step in what has been a continuous journey toward improvement. Within my first month at the Department of Energy, we identified a way to save $1.5 billion over five years by asking ourselves if contractor salaries had ever been compared to the going rates. Appallingly, the answer was no. We surveyed the market and recognized that a large majority of contractor employees were above their salary bands. Understanding that, we froze those salaries for a period of one year. Though a controversial stroke for the Department of Energy, it is the kind of thing over which no one would blink an eye in a business enterprise.

Another area of smart savings lay in how we managed and what we expected from our major contracts. Again, this proved to be controversial but we have initiated contract reforms to focus on an important private sector principle, competition. Many of our contractors have long-standing relationships with the Department and presumed that on a five-year cycle, those relationships would continue. To keep our business, however, these contractors will now need to become leaner and more competitive.

We operated under cost-plus contracts which meant that the contractor, by charging more, could earn more. It didn't make much sense. We are moving to performance-based contracting. If you were building a house, you wouldn't give the contractor free run of the place. You would determine what the costs were for the services and products you want and build in a reasonable fee for meeting goals successfully. If you don't deliver the performance or product, you don't get the award fee.

These dramatic changes, implemented, for example, with the re-letting of the contract at our Hanford facility, saves us a projected $1 billion over the next five years at that one location. At our Idaho facility we consolidated five contracts into one and implemented a performance based contract to save an estimated $750 million over five years. In total we will recompete $40 billion worth of contracts to garner maximum savings and performance. In the last two years we have reduced our contractor work force by 14% from more than 144,000 and expect to reduce this further to under 112,500 by the end of FY 1998.

We are taking a close look at our assets. Some of the many DOE facilities built in our critical efforts to win World War II and the Cold War no longer serve their original function, and we are finding ways they can be of new benefit to the nation. In all, DOE controls 2.4 million acres of land and 100 million square feet of buildings. The Department is opening more of these resources for economic reuse, energy development, and environmental protection. We recently sold our Pinellas, Florida weapons plant for economic development and have leased out space for small business in our Mound, Ohio facility. We are supporting the development of a solar facility at our Nevada Test Site that could provide electricity cost-effectively to 100,000 people in the Southwest. We are working with a group of doctors on the transfer of a surplus nuclear reactor at our Idaho National Engineering Laboratory to treat brain cancer.

THE TOUGH WORK IS UNDERWAY

Over the coming five years, we will cut $8.4 billion from our programs and sell assets worth an estimated $5.7 billion. The result will be a Department more focused on missions of critical value to the nation. To achieve our goals we propose the following program reductions.

For **Environmental Management** we propose to save an estimated $4.4 billion in our Environmental Management program largely through improved management and cost controls, reduced overhead costs, and more effective contractor oversight and contract reform.

We will focus on the highest risk activities within each site. To accommodate the shift to this approach, we will work with regulators to analyze commitments made under existing agreements.

Working with this Subcommittee, we will pursue site-based budgeting and multi-year funding to provide greater accountability and more efficient allocation of resources.

In addition, we will work closely with the Congress on the reauthorization of Superfund, particularly the land-use provisions in the Administration's Superfund proposal, as they are critical to achieving savings.

In the area of **Applied Research** we propose to bring our research and development priorities in line with those of the private sector. We will also curtail or eliminate programs judged to have achieved their program objectives. These reductions will generate $1.2 billion in savings over five years.

A task force led by Dr. Daniel Yergin, President of Cambridge Energy Research Associates and Pulitzer Prize winning author, is looking at how we can improve our applied energy research and development programs. The task force will submit its recommendations in April and these will help shape the details of the $1.2 billion reduction.

As a part of our **Alignment and Laboratory Reform initiatives** a task force headed by Bob Galvin, chairman of the executive committee of Motorola, has examined the post-Cold War role of our national laboratories and has clearly and forcefully validated the importance of the major research and development missions of the Department and its laboratories. The report also concludes the Department's laboratory system is oversized for its missions and could be downsized through efficiencies and the elimination of functions and redundancies. We appreciate the work Bob Galvin and the members of his task force have put into this assessment. It is clear to us that the Department will be able to embrace and act aggressively on the overwhelming majority of their recommendations.

We will specify additional savings of $2.8 billion from our Strategic Alignment Initiative and implementation of the Galvin Task Force recommendations.

We began an initiative in December to strategically align our activities. A task force of Department employees is conducting an intensive four-month review of the organization, targeting for elimination redundant or unnecessary work and management layers. A preliminary report of findings was presented to the alignment team Steering Committee on March 1. The alignment team's final report will be delivered to me at the end of April.

In addition, the Department proposes the following asset sales:

The original purpose of four of our **Power Marketing Administrations**, established decades ago, has been achieved and their functions should be undertaken by non-Federal entities.

Net proceeds from privatizing the Alaska Power Administration, the Southeastern Power Administration, the Southwestern Power Administration, and the Western Area Power Administration are estimated at $3.7 billion. Our proposal will provide customer protection from significant rate increases. We will also submit legislation to transform the Bonneville Power Administration into a Government corporation.

The Department's **Naval Petroleum Reserves** in Elk Hills, California has outlived its original purpose of protecting the Navy from oil shortages. The Navy now purchases almost all of its oil on the open market, and the Strategic Petroleum Reserve can provide an ample supply of oil in a national emergency. The Department proposes a two-step process for the privatization of the Naval Petroleum Reserves. First, we propose that Congress authorize management of the Reserves as a for-profit, federally-owned government corporation, with the ability to maximize net revenues through commercial management and operating decisions.

In the second step of our proposal, we propose to sell the Government's interest in the Naval Petroleum and Oil Shale Reserves in FY 1997. The Department seeks authority in the FY 1996 budget proposal, to obtain a professional valuation of the Reserves and to conduct the necessary studies to ensure that the taxpayer receives a fair market value from the sale of the Reserves.

We expect to submit legislation in the near future that will further define the proposed operation of the corporation and privatize the Reserves.

We propose the sale of **surplus natural and enriched uranium** that we now control, including highly enriched uranium. This highly enriched uranium would be blended down to be made useful as an energy source for commercial reactors. Including the processing costs, the material has an estimated net value of $400 million. We propose to transfer ownership of this material to the U.S. Enrichment Corporation which will market the fuel to utilities. Since the Administration proposes to sell the U.S. Enrichment Corporation to the private sector, the value of the surplus uranium will be realized by the Treasury with the sale of the Corporation.

OUR FY 1996 BUDGET: A PLATFORM FOR MAJOR REDUCTIONS

Last summer, when we looked at the combined future costs of our new commitments—in stockpile stewardship, nonproliferation, Soviet-built reactor safety, Climate Change Action Plan, the Energy Policy Act of 1992, as well as new facilities for high energy physics, nuclear physics, material sciences and biotechnology—we saw a curve that went steadily uphill. We realized that in acting in response to Congressional and Administration initiatives, we were facing a budget that would be out of control within a few years. Our FY 1996 budget halts this trend. It is a launching pad for a steady decrease over the next few years toward the cost-effective achievement of our missions.

The FY 1996 Budget: National Security

To achieve the national security objectives established by the President, the Department requests $4.9 billion in FY 1996 for national security activities. Currently the U.S. is observing a nuclear testing moratorium, working toward an international Comprehensive Test Ban Treaty, and seeking the renewal of the Nuclear Nonproliferation Treaty. At the same time there remains a continuing need to maintain the security and reliability of the enduring nuclear weapons stockpile. In his July 3, 1993, announcement extending the moratorium on underground nuclear testing, President Clinton called on the Department to maintain the safety and reliability of the current stockpile using means other than underground nuclear testing. In passing the FY 1994 National Defense Authorization Act, Congress also recognized this need, directing the establishment of a stockpile stewardship program.

For FY 1996, we request a total of $3.5 billion for weapons activities. Within this amount, we request $1.6 billion for stockpile stewardship to enable us to maintain confidence in the nuclear stockpile through advancements in science and technology. To accomplish this, we include increases for new initiatives such as the National Ignition Facility and the Accelerated Strategic Computing Initiative, and an increase for participation in the Los Alamos Neutron Scattering Center. At the same time, the Department will maintain a three year readiness option to resume underground testing at the Nevada Test Site.

We request a total of $1.9 billion for stockpile management activities of which $50 million initiates a project to provide a new assured tritium source in the United States. The U.S. currently has no production facility for this radioactive gas which magnifies the explosive force of weapons, and relies on recycling and dismantlement to meet current requirements. With a half-life of 12.5 years, tritium must be replaced periodically.

The President has made nonproliferation of nuclear weapons one of the nation's highest priorities. The Administration is working to extend the Nuclear Nonproliferation Treaty and complete work on the Comprehensive Test Ban Treaty. Our focus is to: 1) secure nuclear materials in the former Soviet Union; 2) assure safe, secure long-term storage and disposition of surplus fissile materials; 3) establish transparent and irreversible nuclear reductions; 4) strengthen the nuclear nonproliferation regime; and 5) control nuclear exports.

In FY 1996, we must accelerate these efforts. Our FY 1996 arms control budget increases by more than $85 million over FY 1995 reflecting this need. The Department will work to end production of fissile materials for weapons worldwide through an agreement with Russia to shut down its remaining plutonium production reactors and the U.S. proposal for a global fissile material cutoff. The Department is seeking to reduce stockpiles and use of weapons-usable materials through the Reduced Enrichment for Research and Test Reactors (RERTR) program, and nuclear material purchases. In FY 1996, the Department will also continue an effort begun last year to confirm weapon dismantlement in Russia.

We request a total of $70 million for the area of Fissile Materials Disposition. The program will combine the results of the environmental analysis in the Programmatic Environmental Impact Statement, information from technical and economic studies and National policy objectives, to issue a Record of Decision in 1996 regarding long-term storage and disposition options for fissile materials.

The Office of Fissile Materials Disposition will also coordinate efforts with the United States Enrichment Corporation and U.S. industry to blend down surplus weapons-usable highly enriched uranium for sale as commercial reactor fuel. This will reduce stockpiles of surplus fissile materials and the proposed sale is estimated to return $400 million to the U.S. Treasury. These efforts directly advance U.S. and global nonproliferation interests and are more cost-effective management of the Department's stockpiles of surplus fissile materials.

The Department's Naval Nuclear Propulsion program has achieved a worldwide reputation of excellence and safety. U.S. nuclear-powered ships have steamed over 100 million miles without a single reactor accident. We continue to support over 130 operating naval reactors. The Department develops advanced components for the new attack submarine class, required to maintain the nation's submarine force and industrial base. At the same time, we are deactivating six of eight land-based prototype reactor plants.

All activities related to nuclear weapons development, production, procurement, surveillance, and testing have ceased at our Mound, Pinellas, and Rocky Flats plants. We are transferring 26 activities previously conducted at these sites to the Kansas City Plant, Los Alamos National Laboratory, Sandia National Laboratory, and our Savannah River Site. Many of these transfers will be completed by September 30, 1995. Our FY 1996 efforts will focus on the remaining activity transfers and production capability at the receiver sites.

By the end of FY 1995 the Department will have reduced the cost of protecting its nuclear weapons, materials, and facilities by 20 percent without increasing risks. We are also declassifying millions of documents while protecting information that has the potential to increase the proliferation of nuclear weapons.

Delivering The Critical Missions: National Security Accomplishments

- In support of reductions to the nuclear stockpile, the Department dismantled 1,369 nuclear weapons in FY 1994. As of December 4, 1994, an additional 269 weapons were dismantled.

- Successful completion of a joint DOE/DOD/State Department operation to transfer 600 kilograms of weapons grade Highly Enriched Uranium (HEU) out of Kazakhstan to DOE's Y-12 Plant at Oak Ridge, Tennessee. While at Oak Ridge, the HEU will be under international safeguards. The HEU will be blended down for use in commercial reactors.

- Reduced Departmental security costs by 17%.

- Assumed responsibility for research and development for Comprehensive Test Ban Treaty monitoring. A special satellite (Alexis) was launched with dual use -- it monitors nuclear explosions and provides valuable information to meteorologists.

- Conducted a one-ton chemical test at the Nevada Test Site to demonstrate differences in seismic characteristics of chemical versus nuclear explosions.

- On January 24, 1994, created a department-wide project to focus on the control and disposition of surplus fissile materials and improve coordination of Departmental efforts concerning these materials.

- Signed an agreement with the Russian Minister of Atomic Energy to conduct reciprocal inspections in Russia and the U.S. of facilities storing plutonium removed from dismantled nuclear weapons. On July 23, 1994, a delegation of Russian technical experts visited the Rocky Flats facility.

The FY 1996 Budget: Science and Technology

A total of $2.8 billion is included in our FY 1996 budget for Energy Research programs. In keeping with President Clinton's pledge to make investment in science and its infrastructure a top priority, $100 million is requested to increase operating time and user support at DOE's world-class research facilities. The "Scientific Facilities Utilization Initiative" will be shared by the Basic Energy Sciences, High Energy Physics, and Nuclear Physics programs. This 10% rise in facilities funding will increase user facility operations by approximately 30%. This initiative will immediately benefit the work of thousands of scientists conducting research in a range of disciplines, such as materials science, structural biology, semiconductor technology, and medical science, reversing the recent downward trend in operating time availability of our science facilities.

Because of their significant benefit to the nation, the Department is continuing support for high energy and nuclear physics programs—research that is too long-term and high risk for the private sector to undertake. In FY 1996, the Department is providing increased funding to assure timely completion of the Fermilab Main Injector, $52 million, and the Stanford B-factory upgrades, $52 million, as recommended by the High Energy Physics Advisory Panel. In nuclear physics, $70 million is provided to continue operation of the Continuous Electron Beam Accelerator Facility at Newport News, Virginia and construction of the Relativistic Heavy Ion Collider at Brookhaven National Laboratory.

Our FY 1996 basic energy sciences budget of $811.4 million provides $8 million for research and development leading to the conceptual design of a spallation neutron source, to meet the nation's need for a next generation neutron scattering source. The Advanced Neutron Source project will not be continued in FY 1996. We include $3.2 million for the final construction phase of the world's most advanced x-ray synchrotron light source: the Advanced Photon Source that will provide researchers with a diagnostic beam unsurpassed in intensity by any available today.

Another area where the Department is taking advantage of its scientific investment, is in the field of biological and environmental research, for which $431.7 million is requested in FY 1996. DOE has built up a significant expertise in predicting the health and environmental effects of energy production and use. These research contributions are being used to advance the nation's biotechnology industry, improving health care delivery and enhancing environmental protection.

Our Human Genome Project, $78.5 million in FY 1996, is at the forefront of the international effort to develop and apply technology that can map and sequence the human genome. Our medical applications research continues to advance the development of new radiopharmaceuticals. The Department continues to develop the technology needed to "engineer" and exploit biomolecules such as enzymes, antibodies, and other proteins that can be used in industrial and environmental processes for the conversion of biomass to fuel, increasing agricultural yields, industrial catalysis, and bioremediation.

Our research in fusion energy is aimed at developing an inexhaustible energy source for the future. Progress over the past few years—including record-breaking production of fusion energy by our Tokamak Fusion Test Reactor—has brightened the prospects for fusion energy. Evidence continues to mount that the next generation U.S. experiment, the Tokamak Physics Experiment (TPX), will result in an optimized design for a fusion-powered plant, and that the International Thermonuclear Experimental Reactor (ITER) will demonstrate the scientific and engineering feasibility of fusion power. Our FY 1996 budget for fusion includes $366 million, allowing for the start of TPX construction and continuing U.S.

partnership in the ITER design effort, in collaboration with the European Community, the Russian Federation, and Japan.

The Administration recognizes that significant budgetary commitments will be required to meet the fusion program's programmatic objectives and currently planned milestones. For this reason, the President's Committee of Advisors on Science and Technology (PCAST) will conduct a review of the fusion program. This review, which will include an examination of U.S. participation in ITER construction and the role of the Tokamak project, is intended to be completed by summer of 1995. When the final results of this study are available, the President will review the PCAST recommendations and make a determination on the appropriate future strategy for the U.S. fusion program. Start of construction of the Tokamak project in FY 1996 will await this determination.

Delivering The Critical Missions: Science and Technology Accomplishments

- The Fermi National Accelerator Laboratory published results showing the first direct evidence for the existence of the "top quark," the final basic building block of matter. The New York Times reported that "the Fermilab discovery, if confirmed, would be a major milestone for modern physics because it would complete the experimental proof of the grand theoretical edifice known as the Standard Model, which defines the modern understanding of the atom."

- In November, scientists at the Department's Princeton Plasma Physics Laboratory set a world record of more than 10 million watts of fusion power in the Tokamak Fusion Test Reactor. These high power experiments are a significant step toward demonstrating the scientific feasibility of fusion.

- In September, Argonne National Laboratory sold patent rights to its biochemical "super chip" to decode human genetic information more quickly and cheaply. The advance may speed the development both of treatments for birth defects and other genetic diseases.

- Continuous Electron Beam Accelerator Facility (CEBAF) began operation in July. As many as 1,000 scientists in 200 research institutions have already booked the lab's first three years of experiment time. CEBAF was built to probe atomic nuclei to learn more about the quark structure of matter.

- Researchers used clones of human DNA provided by DOE funded research to locate a gene that contributes to the susceptibility for breast cancer in some women. Researchers at Brookhaven National Laboratory contributed to the location of a DNA repair gene that may be responsible for up to 15% of all colon cancers.

- The Pacific Northwest Laboratory has devised a medical implant technology that mimics the body's natural healing process to create a bond as strong as natural bone. The "biomimetic coating" technology, allows the growing bone and implant to interlock. The new technique, being demonstrated in clinical tests, is less expensive, more compatible with human tissue, more flexible in design, and is expected to lengthen the life of implants.

- DOE-funded scientists at the California Institute of Technology (Cal Tech) discovered new west "amorphous" metal alloys that can be produced in bulk quantities. The breakthrough in "metallic glass," makes possible commercial applications ranging from car parts to machinery to planes. Los Alamos National Laboratory is collaborating with Cal Tech, Teledyne, 3M and Amorphous Technologies to evaluate the commercial potential of the materials.

The FY 1996 Budget: Environmental Quality

The Department is producing dramatic results in cleaning up sites and reducing risks to worker and public safety and the environment created during fifty years of nuclear weapons production.

The FY 1996 Environmental Management budget request is $6.6 billion. The request includes funds for the program's new responsibilities at three major sites, the Mound plant in Ohio, Florida's Pinellas Site, and the Savannah River Site. Despite these significant added responsibilities, the FY 1996 request represents a 4 percent reduction from the FY 1995 appropriation.

Plans for FY 1996 are ambitious. In December, we plan to begin vitrifying the high-level radioactive waste stored at Savannah River in the Defense Waste Processing Facility. We will take a key step toward opening our geologic repository for transuranic waste, the Waste Isolation Pilot Plant in New Mexico, by finalizing plans for compliance with Environmental Protection Agency criteria. At the Hanford site in Washington, a new facility for storing highly radioactive spent fuel will be built, and the existing storage facilities at the Idaho National Engineering Laboratory will be improved. These achievements will greatly reduce the risks to safety and the environment and are among the Environmental Management program's greatest concerns. In other areas, the Department will stabilize over 90 thousand gallons of plutonium solutions at Savannah River, remove all remaining plutonium oxides inside a highly contaminated building at Rocky Flats and remove over 5,900 pounds of spent nuclear fuel from Hanford's PUREX building.

These goals represent only a part of the Office of Environmental Management's responsibilities which encompass a wide variety of activities including: 1) site management functions at the Department's largest sites involving power, water, roads, fire and radiation protection as well as building surveillance and maintenance within these "small cities," 2) supporting the nation's nonproliferation goals through such actions as receiving and managing foreign research reactor spent fuel, and 3) providing security for fissile materials and production facilities over areas covering thousands of square miles.

We have made significant progress in the Civilian Radioactive Waste Management Program. The Director implemented a new program approach in late 1994 and also established a rigorous cost and schedule performance measurement system. This system tracks progress against the metrics of the program approach. To date, the Program has accomplished nearly 90 percent of its scheduled work within the budget for that work.

The FY 1996 budget request for the Civilian Radioactive Waste Program is $630 million, which represents an increase of $107.8 million over FY 1995. The funding for the Program will come from two sources: $198.4 million from the Defense Nuclear Waste Disposal appropriation and $431.6 million in mandatory funding from the Nuclear Waste Fund. The proposed mandatory component is pending passage of legislation which we will submit to Congress in the near future.

The major objectives of the new approach for the Yucca Mountain project are:
1) determine if Yucca Mountain is technically suitable for development as a geologic repository by the end of 1998; 2) if the site is found suitable, deliver a recommendation and environmental impact statement to the President in 2000; and 3) submit a competent license application to the Nuclear Regulatory Commission in 2001.

For waste acceptance, storage, and transportation, the new approach enables us to:
1) provide to the marketplace by 1998 a new generation of storage technology, the multi-purpose canister system, for at-reactor or off-site storage, transportation, and disposal; and 2) prepare for the orderly transportation of spent fuel from reactor sites to centralized storage.

Delivering The Critical Missions: Environmental Quality Accomplishments

- The high-level waste tank 101-SY at Hanford -- one of the most serious risks within the Department -- has had no significant gas release event since the installation of the test mixing pump.

- At the Idaho National Engineering Laboratory, the first 189 transfers of spent fuel to a modern, safer facility were completed. The transfers were completed two months ahead of the court-ordered completion date.

- In February, 1994, disposal shipments of low-level waste from Rocky Flats to the Nevada Test Site began.

- More than 5 million pounds of radioactive and PCB-contaminated mixed waste were treated in FY 1994 at the Toxic Substances Control Act Incinerator in Oak Ridge, Tennessee.

- At the Argonne National Laboratory, approximately 6,000 cubic feet of low-level radioactive waste and 25,000 cubic feet of hazardous waste were treated and disposed of in FY 1994.

- Each of the 48 Department of Energy sites in 22 States which generate or store mixed waste, submitted Draft Site Treatment Plans on August 31, 1994.

- Facility transition and management work at two facilities on the Hanford site were completed ahead of schedule with 10% less funding than anticipated.

- At the Idaho National Engineering Laboratory, construction of the first two RCRA-compliant Waste Storage Facility modules was completed in FY 1994.

The FY 1996 Budget: Energy Resources

Consider these facts: Energy production and consumption account for approximately 16 cents of every dollar of our gross domestic product. Energy-related areas of our economy generate 1.4 million jobs and $11.3 billion in U.S. exports overseas. The typical American family spends more on its energy bills than it does on medical care. For a business or a family trying to hold on in an increasingly competitive economy, every dollar spent on energy is one less dollar spent on higher priority items.

When the oil crisis hit 21 years ago, we realized our economy's vulnerability to the actions of oil-producing countries. Last year, we set a new oil import record: our imports of crude oil were 1.1 percent higher than they were in the last record year, 1977. Some argue that we are not as vulnerable to supply disruptions as we were in the 1970s because our imports today come from a greater variety of foreign sources. We are not as dependent as we once were on a single region of the world. Yet, our reliance on Persian Gulf oil—and our reliance on a stable world economy fed by that oil—is still a significant factor in our nation's foreign policy and national security.

Our energy programs aim to 1) decrease reliance on foreign energy supplies from unstable sources; 2) increase the efficiency of fuel use; and 3) provide cleaner and more sustainable energy resources. Our FY 1996 request for Renewable Energy programs is $423.4 million. We continue to emphasize highly leveraged voluntary partnerships with industry to increase the commercialization of sustainable energy technologies. At the same time, we maintain a focused portfolio of important research and development programs to continue the renewable energy industry's performance progress.

The FY 1996 budget includes funding for a joint DOE/U.S. Department of Agriculture collaboration with industry to promote the production of integrated biomass feedstock and advanced power generation systems. This program will demonstrate near-term market niche opportunities in biomass power systems, highlight the significant potential benefits for rural economic development, and expand world-wide market opportunities for U.S. technologies.

Also included in this request is funding to continue payments of the Renewable Energy Production Incentive (REPI) as established by the Energy Policy Act of 1992. In addition, the FY 1996 budget provides funds for a collaboration between our Office of Transportation Technologies and the Hydrogen Program to demonstrate an optimized hydrogen-fueled internal combustion engine for a hybrid vehicle.

In the nuclear energy research and development area, the Department continues to work toward making standardized, certified, advanced light water reactor designs available before the end of this decade. These designs will ensure that nuclear energy remains an option for the nation's energy supply early in the next century. The Department's advanced light water reactor program is conducted in cooperation with the electric utility and nuclear industries, with the private sector to provide more than half of total program funding in FY 1996. The Department is also pursuing technical, cooperative programs to enhance the safety of existing nuclear energy plants and minimize their premature shutdown. We are also working with former Soviet nations to reduce the risks posed by their aging nuclear power plants.

The Isotope Support Decision Unit established last year, is continued in FY 1996 with funding of $25.4 million. Of this amount, $13.4 million will support isotope production, processing, distribution and other services to customers, and continued programmatic and financial restructuring of the program. The remaining $12 million is to develop the capability to produce Molybdenum-99, the most frequently used radioactive isotope in medicine, and related medical isotopes.

The FY 1996 request includes a total of $355.8 million for the Power Marketing Administrations. Within this amount, $4.3 million is for the Alaska Power Administration, $29.9 million for Southeastern, $30.3 million for Southwestern and $319.9 for the Western Area Power Administration. Budget authority for the Bonneville Power Administration shows a net decrease of $107.3 million due to a reduced level of Federal debt repayment and increases in offsetting collections enabling deferred borrowing. Borrowing authority for Bonneville's capital investments is expected to total $378 million in FY 1996

Delivering The Critical Missions: Energy Resources Accomplishments

- Led successful trade missions with industry to promote advanced U.S. energy technologies, including renewables, overseas. To date, agreements have been reached on over $1.2 billion worth of U.S. based energy projects in India, $4 billion in Pakistan, and over $5 billion in Russia. The United Nations estimates that more than 2 million villages worldwide are without electric power for basic needs. According to the World Bank, anticipated worldwide investment in electric technologies will total $1 trillion over the next several years.

- Together with representatives from the former Soviet nations, DOE developed a five-point nuclear safety improvement plan to reduce the risk from operation of the older, least safe Soviet-designed nuclear power plants. To carry out the plan, more emphasis will be placed on the development of cooperative programs that create the safety culture and infrastructure required to enable host countries to provide for their own needs.

- To ensure Soviet compliance with the Gore-Chernomyrdin agreement to shut down all plutonium reactors for weapons production by the year 2000, DOE initiated a Russian Replacement Power project to work on solutions cooperatively with the Russians. As required by the agreement, DOE has a responsibility to assist the cities of Tomsk and Krasnoyarsk-26 in obtaining financing for replacement power systems, monitoring feasibility studies and construction, implementing safety modifications and evaluating and implementing a plan for advanced energy efficiency. The Office of Nuclear Energy and the Office of Fossil Energy are working together on this effort.

- On a portion of the Rocky Flats site we have created the National Wind Technology Center as a research facility operated by the National Renewable Energy Laboratory, to work cooperatively with industry. In addition, DOE signed a $40 million agreement with the Electric Power Research Institute (EPRI) to verify new technological breakthroughs in wind technology as they occur.

- A Biomass-to-ethanol pilot plant was completed at the National Renewable Energy Laboratory. This facility can test a wide range of feedstocks and accommodate ongoing technical advancements. A new genetically engineered organism has been developed at NREL estimated to lower the cost of ethanol by $.15 to $.20 per gallon.

- Initiated the **Earth Comfort** program designed to expand market use of geothermal heat pumps by 1.5 million units by the year 2000.

- Top-to-bottom reinvention effort at the Bonneville Power Administration resulted in about $17 million annually in dollar savings to electric power customers and a reduction of more than 200 employees. BPA is scheduled to receive the Vice-President's Golden Hammer Award this Spring.

Delivering The Critical Missions: Economic Productivity Accomplishments

Cross-cutting all DOE programs is one of our most critical missions, to help build strength at home by stimulating economic productivity. Here are a few of our successes last year:

- DOE signed its 1,000th Cooperative Research Agreement (CRADA) in August of 1994, more than a year earlier than expected. Industry cost-share of the $2 billion total in research is 58 percent.

- Total Department/industry collaborations of all types equal 4,250.

- Lawrence Berkeley Laboratory (LBL) and **Somatix Therapy Corporation** of Alameda, California, a leader in the field of gene therapy, have signed a $2.5 million, three-year CRADA for Parkinson's disease treatment. **Somatix**'s proprietary process for gene modification, coupled with LBL's unique imaging technologies, will allow doctors to more accurately alter cells and provide detailed monitoring. **Somatix** intends to commercialize the process for disease treatment that will be developed under the CRADA.

- A new company, **Viatex/Recovery Systems**, is selling an on-site acid recycling system that can pay for itself in one year and slash pollution in an industry that generates more than one billion pounds of spent acid annually. The process cuts the volume of pollution up to 90% and recovers acid that companies can then either reuse or sell. DOE's Pacific Northwest Laboratory licensed this technology to the Viatex, Inc. spin-off company. More than 15,000 companies have acid disposal problems that can benefit from this process, ranging from the aerospace industry to local photo processing labs.

- A $52 million cost-shared program involving two DOE labs and 17 major companies, headed by Cray Research, Inc., will pave the way for new supercomputer application in a number of industries. The companies will work with DOE's Los Alamos and Lawrence Livermore National Laboratories to develop software for high-performance parallel processing systems in areas such as environmental modeling, petroleum exploration, materials design, and advanced manufacturing.

- Scientists have developed a new laser technique to diagnose cancer without surgical biopsy. The "optical biopsy" uses light to make an almost instant diagnosis and no tissue has to be removed. Oak Ridge National Laboratory and the Thompson Cancer Survival Center, Knoxville, Tennessee, have found a success rate of nearly 100 percent for diagnosing normal tissues and malignant tumors of the esophagus. Several companies are interested in selling the system and the technique could be available for general use within a year.

THE NEXT CHAPTER

Mr. Chairman, our experience with the private sector has taught us that moving too hastily and without adequate planning leads to downsizing efforts that are not successful. At the Department of Energy, we are doing all we can to bring down the costs of our services to the American taxpayer. But we must do so prudently, and this will take both time and additional expenditures. A wisely managed transition to a smaller, more effective Department of Energy will require careful planning and some new costs in the short run. This is one reason that our FY 1996 budget shows a relatively small proportion of the planned $14.1 savings allocated in FY 1996.

It will, for example, take time to receive appropriate Congressional approvals and divest assets as significant as the Power Marketing Administrations and the Naval Petroleum Reserves. We want to be sure that the taxpayers' investment in these national assets show a valuable return.

Of all the areas where we must apply a measured and thoughtful approach, the possible renegotiation of many of our tri-party agreements on environmental cleanup will be the most sensitive. A prudent renegotiation of these cleanup agreements will be a long, contentious process. Our plan to reduce the Environmental Management program by $4.4 billion over five years relies to a great extent on our success in working with States and the Environmental Protection Agency to apply our cleanup investments according to the urgency of the risks in question. We cannot, and should not, rush this process. The careful assessment of the risks involved in the cleanup tasks ahead—work that may well take longer than the previous estimate of thirty years—is an essential ingredient.

As I have explained to you, our Strategic Alignment Initiative will conclude in April with the steps we will take to reinvent the Department of Energy. Should real savings gained from our realignment affect FY 1996, we will bring these to your attention.

Our work together over the next few months will have historical consequences. We are restructuring the way the Department of Energy conducts its business. A year from now, I will present to you a Department of Energy that is fundamentally different from the organization we have been talking about today. Our goal is to bring laser-like precision to determination of the missions the Federal government must carry out, and to perform these missions far more effectively and at a greatly reduced cost to taxpayers.

Statement of Joseph F. Vivona
Chief Financial Officer
Department of Energy
FY 1996 Appropriations Hearing

Mr. Chairman and Members of the Subcommittee, I appreciate the opportunity to submit a statement on the Fiscal Year (FY) 1996 Congressional budget request for the Office of Chief Financial Officer (CFO).

ACCOMPLISHMENTS

During the past year the CFO published the Department's first Financial Management Strategic Plan. This plan serves as a blueprint for making the Department of Energy a leader in the field of financial management. The plan is intended to guide financial activities through the year 2010 and beyond. The Department made considerable progress in 1994 toward meeting the vision outlined in the Financial Management Strategic Plan which is to enable government to work better and cost less. The following are examples of initiatives and achievements:

Financial Stewardship - We reduced the time required to process travel vouchers from 39 days to instant payment using third party drafts; implemented a program to share "best practices" across the DOE offices; implemented a major streamlining plan of the Department's Federal Managers Financial Integrity Act process; and developed a program to educate all DOE employees on their responsibilities as stewards of taxpayer resources.

Full Partnership - We entered into a formal partnership agreement with the National Treasury Employees Union to cooperate on the implementation of quality initiatives; establish a process improvement team to fully integrate the Department's financial management community to assure consistency in financial management responsibilities; and instituted a quality planning-based budget process which provided a more consensus-based process and a better focus on customer needs.

Customer Orientation - We conducted customer surveys and established improvement programs to implement customer recommendations; trained all CFO employees in customer service and in total quality management; and implemented over 500 ideas received from employees during "Idea Day".

Human Resources Management - We implemented a formal equal employment opportunity plan and filled two upward mobility positions; continued efforts to expand curricula for the financial management development program; and empowered/involved employees by encouraging change and team participation.

Technology/Information Architecture - We continued the design of the Management Analysis Reporting System which will replace the Department's Financial Information System; continued implementation of the Department's automated time and attendance system; completed industry-wide benchmarking studies, "best practices" and system inventory databases, and a standardization of indirect cost terminology; chartered the Financial Information Process Improvement Team to improve the quality of information provided to DOE program managers and developed a long-term plan for integrating departmental business management systems.

OVERVIEW

As Chief Financial Officer, I am responsible for ensuring the financial stewardship of the Department by providing centralized financial direction and oversight, and developing and implementing appropriate policies and procedures for the effective management of the Department's accounting and financial management systems, including financial reporting and management controls.

In addition, my office provides the Secretary with an independent budget planning, analysis, and validation capability and oversees budget formulation and execution processes of the Department. Finally, my office serves as the focal point for the financial management community; financial policy development and interpretation; compliance with the Federal Managers' Financial Integrity Act (FMFIA); and audit resolution of Inspector General and the General Accounting Office audit recommendations.

The FY 1996 budget request of $24.8 million is comprised of three major components: Program Direction, Support Services, and Capital Equipment. The total request for program direction ($17.6 million and 277 FTEs), reflects a net increase of $.7 million for salaries and benefits for annualization of the FY 1995 locality increase and pay raise, and the partial year effect of the FY 1996 locality increase and payraise, offset by a reduction of one FTE. The request for Support Services decreases by 8% reflecting support service contract reductions well above the 3% required by the President's administrative savings initiative. Finally, a Capital Equipment request at the FY 1995 level adjusted for inflation.

Our focus in developing this budget was to continue to improve the effective utilization of resources by streamlining financial processes, empowering employees, and reducing support service contracts. Together, we have established performance goals and measures which are intended to reduce indirect costs, budget justification materials, processing time for travel vouchers, financial reports, and payments; centralize our accounting system in current technology; and address contract reform savings. We are striving to change the way we do business by identifying barriers, embracing reforms, while improving quality.

Mr. Chairman, the Secretary of Energy and the CFO are firmly committed to excellence in all aspects of financial management. The importance of realizing the greatest value for every taxpayer dollar spent, while maintaining the necessary controls to ensure that no dollars are spent unwisely or improperly, mandates that in the field of financial management the Department be a recognized leader and ranked among the best in government and industry. The foundation for achieving this vision is financial stewardship, full partnership, customer orientation, human resources management, and technology/information architecture.

This concludes my presentation.

Statement of William J. Taylor, III
Assistant Secretary for Congressional &
Intergovernmental Affairs
Department of Energy
FY 1996 Appropriations Hearing

Mr. Chairman and Members of the Subcommittee, I appreciate this opportunity to submit for the record the statement on the FY 1996 budget request for the Office of Congressional and Intergovernmental Affairs.

ACCOMPLISHMENTS

Our office performs a broad range of liaison and outreach activities that span the important missions of the Department in meeting our national goals in the area of energy resources, national security, economic productivity, environmental quality, and science and technology. Our primary mission is to promote policies, programs, and initiatives by facilitating the flow of information and advice to our "customers," the people we deal with everyday: Members of Congress and their staffs, plus State and local officials, and Native American representatives. We work to create early customer involvement in the decisionmaking process; coordinating Departmental activities and issues; and developing and implementing legislative strategies.

This year our office developed a strategic plan and during that process we determined that the most important aspect of our office is to "communicate" the decisions and supporting rationale that reflect Administration and Departmental policies--in a timely manner. We articulate those messages through hearings, legislation, briefings, announcements and correspondence. To attain the optimum level of open communication, we will continue to play a proactive role to ensure that the Department is responsive to our customer's interests. As the Department streamlines its functions we will also work with Members of Congress, Governors, State/local officials, Native American governments, and other Federal agencies to keep them informed.

The Department has begun its journey: the realignment of its functions based upon recommendations developed by its own workers. Our goal will be to link the assets of this office with those of the Department to ensure that State and local governments, Native American nations, and the Congress are apprised of the Department's operations through rigorous consultations. The Department's scientific, technological, and engineering expertise can be fully employed to secure our Nation's prosperity only when we fully consult with the Congress and our intergovernmental customers.

Recognizing the Secretary's mandate that openness is essential to accountability and trust, this office works to provide substantial contributions to keeping our customers informed and we will meet this challenge by continuously improving and developing partnerships with our constituent groups on a day-to-day basis. Our goal is to take opportunities to increase our outreach activities to improve the public's perception of the Department's credibility.

Public awareness concerning the preservation of our environment while encouraging economic growth is critical to our mission. We will continue an aggressive outreach program directed at the Department's stakeholders to develop and maintain a positive reputation with congressional and intergovernmental customers and to improve our promptness in responding to requests.

OVERVIEW

The FY 1996 budget of $6.0 million, supports a personnel level of 72 FTEs. The total program direction reflects an increase of $.4M for annualization of the FY 1995 locality increase and pay raise, and the partial year effect of the FY 1996 locality increase and pay raise, plus an increase of two FTE's.

This year, in addition to working on the President's energy and environment initiatives, we have been actively engaged in working on a number of critical issues, particularly: Environment, Safety, and Health; Environmental Management; Environmental Justice; Defense Conversion/Reconfiguration/Jobs Impact; Energy Policy Implementation; Civilian/Defense Nuclear Waste; Technology Development; Mission of the National Laboratories; Energy Supply Initiatives; Worker Safety and Facilities Management; National and Community Service Initiative; and the Department's business priorities and Strategic Alignment.

During the First Session of the 104th Congress, the Department will appear at approximately 104 hearings. We will support program offices in presenting lead testimony for over 130 officials during these hearings. All hearing activities, from the development of testimony and responses to pre-hearing and post-hearing questions in excess of over 1,800 are managed by this office. We have also received 2,544 contracts and grants notifications which necessitated over 8,000 congressional announcements.

The office will be conducting many other outreach activities such as: coordinating energy-related policy and program initiatives crosscutting with other Federal agencies; articulating the Secretary's commitments for energy programs and to ensure that Members of Congress, State, local, and Native Americans are kept informed as the Department moves forward by examining the structure, functions, and financial and human resources for the first time. This office will be working closely with our customers to keep them advised as we move forward to accomplish high priority tasks and eliminate unnecessary overhead.

On behalf of the Office and the Department, we look forward to a continuing and productive relationship. This concludes my presentation.

Statement of John C. Layton
Inspector General
Department of Energy
FY 1996 Appropriations Hearings

Mr. Chairman, I am pleased to have this opportunity to address this Subcommittee. I am John C. Layton, the Inspector General of the Department of Energy.

RESPONSIBILITIES

The major statutory responsibilities of the Inspector General, as stated in Section 4 of the Inspector General Act of 1978, as amended, 5 U.S.C. App. 3, are to detect and prevent fraud and abuse and to promote economy and efficiency in the programs and operations of the Department of Energy. The audit, investigative, and inspection requirements of the Inspector General's Office are as extensive and varied as the Department's mission.

ORGANIZATION

- Audits, Investigations, Inspections -

The Office of Inspector General is comprised of three program offices. A Deputy Inspector General is responsible for each office. The Office of Audits performs all internal audits for the Department and conducts audits of the Department's Management and Operating contractors. Audits of other offsite Department contracts are conducted by the Defense Contract Audit Agency, the funding for which is administered by the Department's Office of Human Resources and Administration. The Office of Investigations is responsible for the prevention and detection of fraud, waste, and abuse in the programs and operations of the Department and accomplishes this mission by conducting investigations. The Office of Inspections performs reviews based on administrative allegations, manages the referral of administrative allegations to DOE management, and conducts management inspections that usually focus on management systems and problem identification. In addition to these three offices, the Office of Policy, Planning and Management performs administrative functions, including the operation of an independent personnel office. The Office of Inspector General is headquartered in Washington, D.C., with personnel assigned to 20 field offices around the country. This organization enables us to conduct audits, investigations, and inspections at the Department's various facilities.

The FY 1996 staffing request of 356 Full-Time Equivalents (FTEs) for the Office of Inspector General is the same as FY 1995, and six fewer than the authorized FY 1994 level.

The Office of Audits is assigned 208 FTEs in FY 1995, the same as requested for FY 1996. It consists of two Headquarters elements, the Office of Audit Operations and the Office of Audit Policy, Plans and Programs, and has auditors located at 19 field sites. Approximately ten contract audit staff years will continue to be required on a permanent basis as a source of specialized expertise. In addition, seven contract audit staff years are planned for FY 1996 to meet the requirements of the Chief Financial Officers Act (CFO) of 1990.

The Office of Audits began implementing the CFO Act by auditing the financial statements of a limited number of commercial activities and revolving funds in FY 1991. The Government Management Reform Act of 1994 requires audit of DOE financial statements for FY 1996. This will require performance of internal control reviews and other necessary audit steps during FY 1996 in preparation for the actual audit work in FY 1997. The full impact of this new requirement will be considered in the FY 1997 budget.

The Office of Investigations is assigned 69 FTEs in FY 1995, the same as requested for FY 1996. The Office is currently operating with two Headquarters components, the Office of Investigative Policy, Plans and Programs; and the Office of Investigative Operations. Investigators are located at 15 field sites.

The Office of Inspections is assigned 41 FTEs in FY 1995, the same as requested for FY 1996. The Office is organized into three elements: the Office of Management Inspections, the Office of Field Operations and Administration, and the Office of Program Inspections. Inspectors are located at four field sites.

ACCOMPLISHMENTS

During FY 1994, the Office of Inspector General continued to focus its attention on major issues affecting the Department's mission and operations, including Management and Operating contract administration; environment, safety and health; infrastructure and financial management.

The Office of Inspector General issued 192 audit reports in FY 1994. These reports contained recommendations which, when implemented over a period of time by management, could result in $1.289 billion being put to better use. Of the 192 audit reports issued, 20 involved Departmental contracts and grants. These reports identified a total of $1.2 million in questioned costs. Thus, the total dollar value of the recommendations and of questioned costs of audit reports for FY 1994 was $1.29 billion.

- Audit of Staffing Requirements at the Westinghouse Savannah River Company (IG-340). Westinghouse could reduce its staff by over 1,800 without lowering effectiveness. Potential savings in salaries and benefits associated with such action could save the Department almost $400 million over the next 5 years.

- Audit of Selected Aspects of the Waste Isolation Pilot Plant Cost Structure (IG-356). The audit team identified $11.4 million in annual savings through reductions in staff. Based on analyses and observations, the audit concluded that the contractor's staffing could be reduced to 583 employees or by 25 percent.

- Audit of Sandia Corporation's Pension Plans and Other Prefunded Benefits (IG-346). At least $408.8 million in excess pension fund assets could be returned to the Government if pension plan terminations and spin-offs occurred.

- Audit of Management and Cost of the Department of Energy's Protective Forces (IG-354). The Department could significantly reduce the $1 billion it spends yearly on safeguards and security by improving the efficiency of its protective force operations. The auditors identified situations where $20 million annually could be saved in addition to a one-time savings of $62 million.

- Audit of Light Vehicle Fleet Management in the Department of Energy (IG-362). By reducing the Department's fleet of light vehicles by 10 percent, savings of about $7 million in vehicle acquisition costs and an additional $3 million annually in reduced operating and maintenance costs could be attained.

- Audit of Uranium Solidification Facility at the Savannah River Site (IG-349). Termination of the construction project and implementation of several other alternatives could potentially save $71 million.

The Office of Inspector General's new approach to auditing the integrated Management and Operating contractors was fully implemented in FY 1994. This customer-oriented, interdependent, tiered audit strategy stresses the need for improved communication and coordination among the Office of Inspector General, Department of Energy Field Offices, and internal audit staffs of the contractors; emphasizes the use of consistent audit guidance; emphasizes the use of risk assessments as the basis for audit plans; relies on the work of internal audit staffs for financial, financial-related, and some performance audits if independent tests by the Office of Inspector General indicate that the audits meet professional accounting standards; creates an audit planning and tracking system; and recognizes the need for flexible audit strategies when criticism or other feedback necessitates rapid response.

The Office of Investigations had 310 open cases as of September 30, 1994. During FY 1994, settlements and recoveries for FY 1994 totaled over $164 million. Of these recoveries, $85 million was for a civil settlement where the OIG was one of the lead agencies in a multi-agency criminal investigation.

Additionally, $75 million resulted from another case where the Office of Investigations participated in a multi-agency task force led by the Defense Criminal Investigative Service. This multi-agency investigation substantiated allegations of mischarging to defense related contracts. Office of Inspector General participation on the task force contributed to obtaining agreement from the contractor to reimburse the Government $75 million to settle allegations of mischarging research and development cost, hazardous waste disposal costs, and foreign direct selling cost to Government contracts.

During FY 1994, the Office of Investigations referred 66 cases for prosecutive determination and 46 investigations were accepted for prosecution. Office of Inspector General criminal cases resulted in 20 indictments and 23 convictions during FY 1994. The Office of Investigations is continuing to realign case priorities toward investigations focused on more complex violations of Federal criminal and civil statutes. Areas of increased focus include contract fraud; environment, safety and health related crimes; and computer related fraud. To achieve these new investigative priorities, the Office of Investigations is evaluating the possible realignment of resources.

The Office of Inspector General Hotline received a total of 472 complaints during FY 1994, with nearly 11 percent of the complaints received by the Hotline resulting in the opening of an investigation. An example of a case resulting from a Hotline complaint occurred in 1993 when it was reported that a subcontractor was allegedly overcharging the Strategic Petroleum Reserve for valve actuator replacement parts. Because of the Hotline complaint, Government overpayments were substantiated and, in 1994 a $45,398 recovery settlement was made with the subcontractor.

The Office of Inspector General issued 35 inspection reports in FY 1994. Examples of these reports include:

- In the Property Controls area, an inspection disclosed serious management weaknesses pertaining to the control and disposal of excess personal property, including the storage of electronic and computer equipment in unprotected outside locations.

- An inspection in the Reimbursable Program area reviewed six classified work-for-others projects and documented the need for stronger management controls in financial, procurement and contract, and security areas. In addition, the Office of Inspector General found that DOE had been improperly charged at least $405,000 for one work-for-others project after Lawrence Livermore National Laboratory ran out of funds from the customer.

- An inspection of procurements by Westinghouse Savannah River Company and Bechtel Savannah River, Inc. (BSRI) from their parent or affiliated companies identified three specific examples of Off-Project-Work Requests between BSRI and its parent company and other affiliated companies where indirect costs totalling approximately $970,000 had been improperly authorized. In addition, procurements made by the contractors with their affiliated companies were not being adequately reviewed for potential conflicts of interest.

- In February 1994, the Department reported that 727 Cooperative Research and Development Agreements were in existence with a total value of $1.6 billion (Federal and private sector contributions). An inspection identified four issues in the Technology Transfer Program that needed management attention: (1) there was a lack of uniform budget guidelines for the Department's technology transfer activities, (2) there was a lack of objectives for the Department's Technology Transfer Program, (3) the budget and accounting information submitted to OMB regarding the Department's technology transfer activities was incomplete, and (4) there was a lack of performance measurements for assessing the Department's Technology Transfer Program.

- An inspection of the Cost Reduction Incentive Program at the Department of Energy's Idaho Operations Office determined that the Department needed to perform a full accounting records validation of contractors' cost savings which the Department realized. The inspection also determined that cost reduction incentive programs may result in conflicts of interest in that contractors may defer work to receive an incentive fee.

Also, during FY 1994, the Office of Inspections established and implemented an automated Management Information System for reporting the outcomes of inspection activities. Some of the outcomes reported for FY 1994 were: (1)Inspection Recommendations Accepted - 193; (2) Inspection Recommendations Implemented - 94; (3) Funds Saved or Put to Better Use - $32,000,000; and (4) Allegations Resolved - 326.

The Office of Inspections coordinates the Office of Inspector General's review of existing and proposed legislation and regulations relating to Departmental programs and operations. During FY 1994, the Office coordinated and reviewed 43 legislative and regulatory items and Department Orders.

The Office of Inspections has the lead responsibility for the Office of Inspector General for oversight of Department intelligence activities performed in accordance with Executive Order 12863, "President's Foreign Intelligence Advisory Board." A quarterly report is prepared to the Intelligence Oversight Board in accordance with the Executive Order.

The Office of Inspector General continues to take an active role in assisting the Department in meeting the requirements of the Federal Managers' Financial Integrity Act. The Inspector General is a member of the Department of Energy's Internal Control and Audit Review Council, which is the senior Department management council established to review and oversee Departmental audit resolution and follow-up activities. Also, the Office of Inspector General continues to work closely on cooperative efforts with the President's Council on Integrity and Efficiency and Executive Council on Integrity and Efficiency.

Our Office's Semiannual Report covering activities for the first half of FY 1995 will be submitted to you in May 1995. Semiannual Reports for FY 1994 are being submitted under separate cover.

FUNDING LEVEL

In FY 1995, a funding level of $32,425,000 (26,465,000 adjusted for use of prior year balances of $5,960,000) and 356 FTEs are authorized. In FY 1996, our request is for $32,913,000 ($30,998,000 adjusted for use of prior year balances of $1,915,000) and 356 FTEs.

OUTLOOK

The Office of Inspector General will continue to focus its efforts on reviewing those critical areas associated with Presidential and Secretarial initiatives in the areas of energy, the environment, and the economy. Emphasis will be placed on contract administration, financial management, technology transfer, environmental safety and health issues, nuclear waste disposal, safeguards and security, and weapons program reconfiguration.

Because financial management issues cut across all Department program areas, we have consistently devoted much of our audit resources to financial and financially-related audits. We will continue to perform audits required by the Federal Managers' Financial Integrity Act and other legislation or regulations, and review vouchers submitted by the integrated contractors and to examine controls over reimbursable work and construction projects. In particular, our new comprehensive, cooperative audit strategy is consistent with the Department's "Making Contracting Work Better and Cost Less" report, which calls for the Office of Inspector General to place high priority on the review and evaluation of contractors' financial management systems. The Office of Inspector General work plans reflect new and changing priorities of the Department. Moreover, the audit role of the Office of Inspector General is more important than ever in the financial arena with the increased emphasis to balance the budget.

Other ongoing audit work in the financial management area includes evaluating whether the Department is reimbursing contractors for unallowable costs and the reasonableness of overhead and indirect costs associated with operating the Department's contractor facilities and functions. We are also reviewing the quality of internal audit coverage provided by the Management and Operating contractors.

The Office of Audits continues to review Department programs involving major systems acquisitions and other procurement activities. Some specific reviews that will commence in FY 1995 include continuing coverage of the shutdown of the Superconducting Super Collider project office and a review of procurement procedures at the Federal Energy Regulatory Commission.

Notwithstanding the end of the Cold War and current activities to reduce the number of nuclear weapons, the Department remains responsible for maintaining the nation's nuclear weapons deterrent. Other key national security missions involve: reducing nuclear stockpiles by safely dismantling thousands of nuclear weapons; enhancing the technology infrastructure; reconfiguring the Department's national security infrastructure to meet all current and future requirements; and executing national security policy in the areas of arms control and treaty verification. Among the audits planned for FY 1995, therefore, are: an audit of the maintenance of surplus facilities to determine whether deactivation and decontamination can and should be accelerated and whether maintenance and surveillance costs can be minimized; and, an audit of demolition costs for buildings replaced by new construction.

In the area of environment, safety and health, areas of concern will continue to be waste management, environmental restoration, facility transition and management, uranium enrichment decontamination and decommissioning, technology development, nuclear waste disposal, and safety and health. Audits planned for FY 1995 include: an audit of the reasonableness of cleanup standards and costs for the Department's Environmental Restoration and Waste Management Program; an audit of the justification for construction of waste handling facilities at various sites; a survey of the efficacy and cost effectiveness of the decontamination and decommissioning efforts; a review of plans for developing multipurpose canisters for civilian radioactive waste for acceptance and storage of spent nuclear fuel in 1998; and, a review of treatment and disposal plans for approximately 61 million gallons of high-level, mixed waste at various Departmental sites.

The Office of Investigations will continue to promote the effective, efficient, and economical operation of Department programs and initiatives, through the conduct of investigations associated with contract and procurement fraud; environment, safety, and health issues, including restoration and nuclear waste disposal; safeguards in administrative operations such as cash funds, travel, and time charging practices; and the integrity of both Departmental and contractor employees. As required by statute, the Office of Inspector General will continue to promptly refer information indicating violations of Federal criminal laws to the Department of Justice for prosecutive consideration. The Office of Investigations will also pursue available civil remedies such as under the False Claims Act. When there is evidence of violations of Department regulations, abuses of authority or mismanagement, the information is referred to Department management for appropriate administrative action. In all cases investigated, attention is given to correcting systemic deficiencies in Department programs and operations.

The Office of Investigations will emphasize joint projects with the Offices of Audits and Inspections with respect to Departmental activities in procurement; environment, safety and health; effective utilization of national laboratories; energy efficiency; weatherization grants; and other concerns identified by the Secretary and the Office of Management and Budget. Office of Investigations field investigators and Headquarters staff monitor Daily Operations Reports and Unusual Occurrence Reports for indications of equipment and supply failures.

The Office of Inspections will continue to perform inspections and analyses required by the Inspector General, with the 41 FTEs assigned in FY 1995. The Office of Inspections will continue to perform inspections of administrative allegations, received by the Office of Inspector General's Hotline and other sources, and any management issues resulting from the inspection of the allegations.

In addition, the Office of Inspections will continue to manage the Office of Inspector General Management Referral System. Under this system, selected complaints/allegations are referred to DOE management or other agencies for action. In FY 1994, 403 matters were opened under the Management Referral System. We are projecting that a total of 460 matters will be worked in FY 1995.

Further, the Office of Inspections will continue its required intelligence oversight activities and the coordination of the required review of draft legislation and regulations.

I appreciate the opportunity to provide this statement to the Subcommittee and would be pleased to respond to any questions you may have.

Statement of E. Barclay Van Doren
Chairman, Board of Contract Appeals
Department of Energy
FY 1996 Appropriations Hearing

Mr. Chairman and Members of the Subcommittee, I appreciate this opportunity to submit a statement on the FY 1996 Congressional budget request for the Department of Energy Board of Contract Appeals.

The Board of Contract Appeals is an administrative tribunal established by the Secretary under the authority of the Contract Disputes Act of 1978. It consists of three Administrative Judges responsible to the Secretary and under law for the fair and independent trial and adjudication of a variety of disputes. Its decisions constitute final agency decisions and are not subject to review or modification by the Department. With few exceptions, these disputes relate to the Department's extensive acquisition and financial assistance programs and arise out of activities funded by the Energy and Water Development Appropriations acts.

Most Board cases are "appeals" by a contractor from a decision issued by a Department contracting officer. Although called an "appeal" (because a decision by a contracting officer is needed to trigger the case), Board cases are similar to traditional law-suits where a contractor sues an owner over a contract dispute. The contractor is in the position of the plaintiff who sues, and the Department is in the position of the owner defendant who is being sued. The contractor and the Department are the parties to the case.

The Board tries and decides these cases in a manner similar to a trial court in non-jury cases. As in a law-suit, in a typical case, the parties file pleadings (complaint and answer), conduct discovery, make motions, offer evidence in accordance with the Federal Rules of Evidence, examine and cross-examine witnesses, present oral arguments, and file briefs. Thereafter the Board, like a court, issues a written decision based upon the evidence and the law. This decision is binding upon the contractor and the Department. Both the contractor and the Department have a statutory right to appeal a Board decision directly to the U.S. Court of Appeals for the Federal Circuit.

The Board also sits as the Department's Financial Assistance Appeals Board, Invention Licensing Appeals Board, Patent Compensation Board, and Contract Adjustment Board; decides certain subcontractor appeals under the provisions of management and operating contracts; and, to the extent resources permit, provides hearing officers for environmental, Debt Collection Act, employee salary offset, and other miscellaneous proceedings as requested by Departmental officials.

ACCOMPLISHMENTS

- Integration of alternative dispute resolution (ADR) into all its adjudicatory functions and expanding the range of ADR services provided by the Board.

- Measures to accelerate case processing including increased concurrency of procedural steps and routine use of facsimile for filings and orders.

- Meeting the Board's tight internal target dates for case completion.

These accomplishments have resulted in better service to, and cost savings for, the contracting public and the Department.

The following summarizes the FY 1995 funding level and the FY 1996 request:

	(Dollars in Thousands)	
	FY 1995	FY 1996
Salaries and Expenses....................	$758	$792
Total..	$758	$792

Overview:

The FY 1996 budget request for the Board of Contract Appeals is $792,000. This includes $784,000 for salaries and benefits for eight full-time equivalent positions and $8,000 for employee travel and training. The increase reflects the full effect of the FY 1995 locality pay and pay raise and the partial year effect of the FY 1996 locality pay and pay raise.

During the forthcoming FY 1996, the Board expects to advance the quality and economy of Board services through the following new and continuing measures:

- Publication of a pamphlet on Board ADR services that presents issues for consideration by parties interested in ADR and describes various forms of ADR available through the Board, in an effort to further increase use of ADR.

- Outreach activities intended to inform the general public, Departmental and contractor personnel, and attorneys of Board procedures and services including ADR.

- Revision of the Board's procedural rules to implement the Federal Acquisition Streamlining Act and to otherwise update the rules in the interests of economy, expedition and fairness.

- Further refinement of the Board's Model Comprehensive Scheduling Order and establishment of guidelines for its use.

- Continuing emphasis on compliance with internal Board target dates for case completion.

Let me close by stating that each member of the Board of Contract Appeals is committed to carrying out the Board's mandate within your approved budget structure. We recognize how important it is to you and your constituents and to the American public that the Board provide impartial, economical, expeditious, and independent adjudication of contract disputes between the Department and its contractors. We are dedicated to fulfilling this important trust.

This concludes my presentation.

STATEMENT OF

CORLIS S. MOODY

DIRECTOR

OFFICE OF ECONOMIC IMPACT AND DIVERSITY

U.S. DEPARTMENT OF ENERGY

FY 1996 APPROPRIATIONS HEARING

BEFORE THE

COMMITTEE ON APPROPRIATIONS

SUBCOMMITTEE ON ENERGY AND WATER DEVELOPMENT

U.S. HOUSE OF REPRESENTATIVES

MARCH 7, 1995

Statement of Corlis S. Moody
Director of the
Office of Economic Impact and Diversity
Department of Energy
FY 1996 Appropriations Hearings

Mr. Chairman and Members of the Subcommittee: I appreciate the opportunity to discuss the Fiscal Year 1996 Congressional budget request for the Office of Economic Impact and Diversity for Fiscal Year 1996 is $8,258,000. The objectives of the Office of Economic Impact and Diversity's multi-faceted activities are to accomplish statutory requirements of the legislative mandates and applicable regulations, through the development and implementation of structured activities. Effective implementation of programmatic and other activities will result in significant enhancement of the diversity of the work force, minority educational and financial institutions, and small, minority and disadvantaged business enterprises. The major activities will focus on compliance with regulations promulgated by the Equal Employment Opportunity Commission and assuring full utilization of all employees.

Also, the Office of Economic Impact and Diversity will focus on research and development collaboration of business enterprises and minority educational institutions with the national energy laboratories and the private sector, for technology transfer and commercialization opportunities.

In addition the Office of Small Disadvantaged Business Utilization plans to increase the number of minorities and small and disadvantaged businesses participants in the energy and environmental technology industries through targeted technical assistance programs.

The office will also focus on the development and transferring of disaggregated socioeconomic data, analytical methods and related technical energy and environmental information to government agencies, public utilities and their regulatory agencies, and business organizations.

OFFICE OF ECONOMIC IMPACT AND DIVERSITY'S FY 1995 ACCOMPLISHMENTS

- The Office of Economic Impact and Diversity developed a comprehensive Strategic Plan for Diversity. The plan addresses all aspects of the Department's Diversity efforts, including diversifying the work force; creating partnerships with small, minority and women-owned businesses and partnering with minority educational institutions. Copies of the plan were distributed throughout the Departmental complex, including a copy to each employee.
- The Small Business accomplishments managed for the Department included awards totalling $3.3 billion to small, small disadvantaged, and women-owned businesses, which represents over 35 percent of the Department's $9 billion procurement budget.
- The minority banking dollars increased from $53m to $206m, which is 153m increase over Fiscal Year 1994. These funds are from the Petroleum Violation Escrow Account.
- The Office of Economic Impact and Diversity championed the effort to meet the Secretary's goal of providing additional support to Historically Black Colleges and Universities.
- Environmental Justice Strategy was developed for the Department of Energy, and coordinated with all Departmental elements to develop all required documents and reports mandated by Executive Order 12898 on Environmental Justice. The Office of Economic Impact and Diversity presented the Department's approach at meetings and drafted the outline of the Department's strategy.
- Civil Rights managed and completed the close out of 144 EEO investigation complaints; processed 160 new complaints; processed 75 headquarters' counseling requests; and incorporated various functions to serve as the Department's enforcer to ensure that the civil rights of employees are protected.

Mr. Chairman and Members of the Subcommittee, this concludes my presentation. It has been a privilege for me to discuss the programs and other activities of the Office of Economic Impact and Diversity with you.

STATEMENT
OF
DONALD W. PEARMAN, JR.
ASSOCIATE DEPUTY SECRETARY
FOR THE
OFFICE OF FIELD MANAGEMENT

BEFORE THE COMMITTEE ON APPROPRIATIONS
SUBCOMMITTEE ON ENERGY AND WATER DEVELOPMENT

UNITED STATES HOUSE OF REPRESENTATIVES

MARCH 7, 1995

Statement of Donald W. Pearman, Jr.
Associate Deputy Secretary for
Field Management
Department of Energy
FY 1996 Appropriations Hearings

Mr Chairman and Members of the Subcommittee, I appreciate the opportunity to discuss the FY 1996 budget request for the Office of the Associate Deputy Secretary for Field Management.

OVERVIEW

There are two dominant themes supporting the Department's budget requirements over the next five years: new missions in a changed world, and an aggressive effort to manage the Department's resources more efficiently and cost effectively. The Office of Field Management is a field focal point for a number of reform actions supporting these themes.

This Office has four primary functions: first, to serve as a change agent in support of the Department's goals of streamlining, decentralization, and implementation of a more performance-based management of our programs and projects freeing the field from unnecessary oversight; second, to oversee the general administration of the Department's eight Operations Offices as well as the Rocky Flats Environmental Technology Site and the Ohio Field Office; third, to manage a variety of ongoing, cross-cutting activities that involve both the field and Headquarters, such as facilities management, etc., and fourth, to increase HQ/Field communication through partnering, facilitation, and complex-wide process improvement activities.

As part of our primary functions, Field Management has worked to: enhance communication; resolve cross-cutting issues; ensure consistency in guidance to the field; when appropriate, serve as the field's advocate on complex-wide issues; and finally, to ensure that a field perspective is present at Headquarters when developing policy or making key decisions. An example is the ongoing initiative associated with contract reform. Field Management participated fully in the studies which led up to the report and helped develop the recommendations it contains. Field Management has taken a leadership role in helping implement the initiatives in a consistent and effective manner across all field activities to reduce operating costs, reporting burdens, and oversight activities.

MISSIONS AND FUNCTIONS OF THE OFFICE OF FIELD MANAGEMENT

The mission of the Office of Field Management is to provide direction, policy, management and coordination to all of the Operations Offices as well as the Rocky Flats Environmental Technology Site and the Ohio Field Office. In addition, Field Management is responsible for providing the entire Department with policy and support in the cross-cutting areas of facilities management, systems acquisition, and contractor employee protection.

In implementing these missions, the Office of Field Management performs the functions of management coordination, and support, including review of field resource allocations, infrastructure requirements, landlord oversight, and strategic planning for all field elements.

Field Management has specific responsibilities in the areas of real estate/facilities management, utilities acquisition/rate-case intervention, project management, and independent cost estimating for large construction projects In addition to these responsibilities, the Office acts as a neutral facilitator for resolving headquarters/field conflicts as they arise.

Finally, the Office of Field Management has program responsibilities in the area of Contractor Employee Protection - providing a formal process to resolve complaints lodged by contractor employees concerning possible retaliation In addition, we have the lead in strengthening and expanding existing employee concerns programs throughout the Department to ensure employees have a readily available mechanism to voice concerns and have those concerns addressed

FISCAL YEAR 1996 BUDGET REQUEST

The FY 1996 budget request for the Office of Field Management is $16 6 million within the Departmental Administration Appropriation Of this amount, $8.9 million and 105 FTEs is for program direction. This represents an increase over FY 1995, of $0.9 million, includes 7 FTEs in support of environmental management activities, and the FY 1996 locality increase and pay raise.

The request for support services of $7 6 million, represents a 3 percent increase for development of a Facilities Information Management System (FIMS) which will inventory real property, and a records management system to administer contractor employee case files, infrastructure acquisition, and freedom of information requirements. Finally, a Capital Equipment request at the FY 1995 level adjusted for inflation

PROGRAM ORGANIZATION

The Office of Field Management is composed of the following:

The Office of Infrastructure Support Services is responsible for developing and implementing Departmental policy in the areas of real estate, land use planning, utilities management, facility maintenance, capital asset management, infrastructure and landlord activities.

The Office of Contractor Employee Protection investigates and, in most cases, adjudicates complaints of whistleblowers who may have suffered reprisals. The Office will also have the lead in strengthening and expanding employee concerns programs.

The Office of Infrastructure Acquisition Services is responsible for Departmental project management policy and implementation in supporting the Secretary on key decisions for large acquisitions, conducting independent cost estimates for large projects, and improving Departmental business practices. This office is also responsible for the orderly, cost effective termination of the Superconducting Super Collider project.

The Office of Field Services and Liaison serves as a focal point for resolving issues and concerns, improves communications, and facilitates cross-cutting activities such as Defense Nuclear Facilities Safety Board matters.

The Office of Resource Management and Services is responsible for providing administrative support to the Field Management Headquarters organization, and the Operations/Field offices with emphasis on budget, manpower, and organizational planning

OBJECTIVES AND ACCOMPLISHMENTS

The Office of Field Management's FY 1994 accomplishments and FY 1995 objectives demonstrate our contribution to continuous improvement while reducing expenses and the Department's cost of operations. achieved, in FY 1994, $8 6 million in cost avoidances as a direct result of partnering with the Defense Fuel Supply Center for competitive acquisition of natural gas; avoided approximately $15 million in utility rate hikes from our regulatory interventions over the last five years, championed the streamlining and revision of DOE project and facility management orders, thus reducing over a thousand pages of requirements to only several; trained program managers to more efficiently operate project control systems, developed and implemented new systems to fully support facility maintenance and capital asset management, providing accountable and consistent information for planning and budgeting major procurement and life cycle costs in the Department.

In full support of the Department-wide Total Quality Management effort, we are focusing our partnering activities to enhance employee involvement and corporate responsibility Since April, 1992, the Department has received over 120 complaints from contractor employees alleging retaliation Sixty-five of these cases have been closed, many providing significant relief to complainants In addition, over the past year, the Department has announced its "zero tolerance for reprisal" policy and has published for public comment five new Whistleblower Initiatives We will shortly finalize these initiatives, thereby providing additional protection to our contractor employees.

Currently, we are developing a streamlined management and an operating contractor real property leasing process. In addition, we are providing expanded cost estimating processes to include indirect and total project cost estimates.

Our organization has met the Secretary's goal of achieving an employee-to-supervisor ratio of 10-to-1; including the field offices. We are on track with the National Performance Review to achieve a 15-to-1 employee-to-supervisor ratio by FY 1999.

In FY 1996, the Office will continue its aggressive efforts in all of the above areas. In addition, the Office will lead the Department's effort to: establish a performance-based oversight process that will eliminate the proliferation of requirements, overlapping roles and responsibilities, and compliance-based reviews by moving toward one multidisciplinary oversight visit per year, per site, implement a performance-based life cycle corporate approach for the planning, acquisition, operation, and disposal of the Department's Infrastructure for meeting mission needs and lowering cost with no sacrifice in quality; implement a Comprehensive Landlord Integrated Facilities Planning Process for the Department to ensure efficient, consistent, and comparable resource application and utilization through the DOE complex, and continue to serve as a change agent for DOE acquisition reform by certifying 80 percent of Major System Acquisition project managers by the end of FY 1996, and delegating 20 percent of Major System Acquisitions to Program Officers and Field Managers

PERFORMANCE MEASUREMENTS AND INDICATORS

The management focus for FY 1996 will continue Departmental streamlining, decentralization of authority to the field, and improved management capabilities To this end, each organization within Field Management is now in the process of institutionalizing quantitative and qualitative performance measurement criteria and reporting methods Specific results are and will continue to be clear in each of these areas Examples of continuing improvement are ratios of supervisors-to-employees, increased delegations of key decision authority to the field under the project management system, and the initiation of a pilot performance-based process centered on a single multidisciplinary yearly site review.

Mr. Chairman, this concludes my statement

STATEMENT OF
ARCHER L. DURHAM
ASSISTANT SECRETARY FOR
HUMAN RESOURCES AND ADMINISTRATION
U.S. DEPARTMENT OF ENERGY
BEFORE THE
SUBCOMMITTEE ON ENERGY AND WATER DEVELOPMENT
HOUSE COMMITTEE ON APPROPRIATIONS
MARCH 7, 1995

STATEMENT FOR THE RECORD

Statement of Archer L Durham
Assistant Secretary for
Human Resources and Administration
Department of Energy
FY 1996 Appropriations Hearing

Mr Chairman and Members of the Subcommittee, I appreciate the opportunity to discuss the Fiscal Year (FY) 1996 Congressional budget requests for Human Resources and Administration and the Office of the Secretary funded by the Departmental Administration Appropriation

FY 1995 ACCOMPLISHMENTS

Mr. Chairman, before I present an overview of Human Resources and Administration's budget request, I would like to take this opportunity to highlight a few of our significant accomplishments of the past year Thus far in FY 1995 Human Resources and Administration has supported the Department's strategy for communication and trust both internally and externally Communications with the public have been enhanced through our electronic mail capabilities and our Home Page capabilities on the Internet The Department participated in a Government-wide Legislative Liaison Electronic Mail Pilot Project, and was the first agency with an operational system. Nationwide electronic mail is being used to allow the Secretary of Energy to distribute information to all Federal contractor and laboratory personnel and also is providing a means for exchanging information electronically among all personnel in Headquarters, field offices and national laboratories

In addition, the Computer Incident Advisory Capability provided Departmental sites with on-site information security advice and technical assistance and provided Internet security training to all Federal agencies through technical seminars presented at the National Institute of Standards and Technology in support of the Administration's National Information Infrastructure initiatives

We have upgraded the Departmental Streamlining Plan and continue to provide the leadership to assure that the commitments made in the plan are implemented Implementation of the Streamlining Plan supports the Administration's National Performance Review objectives for increasing employee to supervisor ratios and reducing the number of organizational layers in the Department.

We are also implementing the Presidential electronic commerce mandate for streamlining procurement by successfully initiating electronic commerce capability and issuing electronic solicitations and purchase orders

We have initiated and implemented the Technical Leadership and Development Program for entry level engineers and scientists who comprise a cadre of exceptionally qualified and well-trained engineers and scientists who are fully capable of performing demanding technical skills

We continue to implement the Defense Nuclear Facilities Safety Board Recommendation 93-3 including obtaining excepted service appointment authority, establishing policies and procedures for its implementation and beginning recruitment processes for its use

We have achieved the goal of a 20 percent reduction in energy consumption from FY85 usage in Department of Energy Headquarters federal buildings ahead of federally mandated schedule through cost effective and energy efficient building operations and retrofit projects.

We have also reduced Department of Energy Orders by 24 percent as of January, 1995, with a goal of reaching 50 percent by the end of this fiscal year. This process has eliminated, streamlined and consolidated Department orders thus increasing the effectiveness of Field and contractor staffs.

The Office of the Assistant Secretary for Human Resources and Administration is focusing on two major initiatives for FY 1995 and FY 1996: work force rightsizing and development of shared corporate information systems. Human Resources and Administration recognizes the importance of the "Federal Work Force Restructuring Act of 1994" and continues to actively address work force redeployment and rightsizing initiatives. With the Department currently undergoing a major strategic alignment process focusing on program priorities, this office is implementing support systems to enhance implementation of recommendations from the Strategic Alignment Initiative and the Administration's National Performance Review. Human Resources and Administration also advocates and leads the development and integration of common, shared corporate information systems which are needed to support proactive, efficient and cost effective management of the Department's business lines

FY 1996 OVERVIEW

The FY 1996 budget request for the Office of the Assistant Secretary for Human Resources and Administration is $197.5 million, which consists of $69.9 million for salaries and related expenses, and $127.6 million for support services and capital equipment. The FY 1996 budget request for the Office of the Secretary is $3.6 million for salaries and related expenses.

OFFICE OF THE ASSISTANT SECRETARY FOR HUMAN RESOURCES AND ADMINISTRATION

Human Resources and Administration provides centralized administrative support, oversight, and policy direction for Department wide activities including:

- Organization and staffing management, and administration of management systems; personnel management and administration of professional and technical training and development; management of information services, including information resources management, telecommunication and automated data processing acquisition and services; Headquarters administrative services; management and oversight of procurement, acquisition and financial assistance activities, and contractor human resource management; and administrative support to the Office of the Secretary

The FY 1996 budget request of $197.5 million for Human Resources and Administration includes $69.9 million for salaries and related expenses, and $127.6 million for contractual support services and capital equipment in the multiple support areas mentioned above

The $69.9 million requested in the Departmental Administration Appropriation for salaries and related expenses is a $4.1 million increase from $65.8 million in FY 1995. The increase includes support of an additional 11 FTEs to support environmental management activities, plus the full effect of the FY 1995 locality pay increase and pay raise and the partial year effect of the FY 1996 locality increase and pay raise This increase was partially offset by an FTE decrease of 38 in accordance with National Performance Review reductions. In addition our travel request reflects a decrease in accordance with the President's administrative savings initiative adjusted for inflation.

A total of $127.6 million is requested for contractual support services and capital equipment. Our request includes a decrease for support services (exclusive of rent), adjusted for inflation in accordance with the President's administrative savings initiative plus a decrease of $1.5 million for resource information management efficiencies Some of these savings have been applied to contract audit and closeout activities to resolve the existing audit backlog

OFFICE OF THE SECRETARY

The Office of the Secretary sets the tone in establishing U S leadership in nonproliferation of nuclear weapons, science and technology, energy efficiency and global environmental stewardship, and energy resource development technology The Office of the Secretary also establishes the strategic direction of the Department with input from the Department's customers and stakeholders

PERFORMANCE MEASURES

The performance measures established for the Office of the Assistant Secretary for Human Resources and Administration are

- Reduce FTEs in accordance with National Performance Review goals
- Increase supervisor-employee ratio to DOE goal of 10:1 in 1995
- Improve contract management and administration by incorporating the full range of contract reform elements in seven major DOE contracts expiring in FY 1996 and establishing a methodology for a baseline by which savings can be measured
- Conduct small purchases through electronic data interchange at eleven contracting activities

Mr. Chairman, this concludes my presentation

Statement of Susan F. Tierney,
Assistant Secretary for
Office of Policy
Department of Energy
FY 1996 Appropriations Hearings

Mr. Chairman and Members of the Subcommittee,

I am pleased to present the FY 1996 budget request for the Department of Energy's Office of Policy. I believe we share a mutual interest in ensuring that our policy work benefits taxpayers at the least cost. Let me begin by discussing the Policy Office's essential role in making the Department a leaner, more efficient and responsive provider of vital energy related services to the American public.

ROLE OF THE OFFICE OF POLICY

As a nation, we face a number of critical energy, environmental and defense concerns, that generate significant policy implications. This year, for the first time, we are importing over half the oil our country consumes. Rising oil imports, along with rising environmental emissions, are increasing due to our growing transportation sector. Our vital electricity industry is changing rapidly in response to federal legislative changes, new technologies and economic pressures. Global competition from nations that subsidize research and development on energy-related technologies threatens to undermine our export potential, U.S. firms' livelihood and U.S. jobs. The threat of global warming due to greenhouse gas emissions has become an issue of major economic importance to the U.S. energy sector. The management of the country's radioactive waste, both civilian and defense-related, presents enormous political and economic challenges. Domestic solutions alone are insufficient to meet the global nature of many of these challenges, therefore requiring enhanced international efforts and cooperation.

These examples of issues confronting our Department require careful thought, research, analysis, representation, as well as integration and coordination among the sometimes conflicting views within DOE and other agencies. These are the primary businesses of the Office of Policy.

As an organization, the Department of Energy has its origins in efforts as diverse as the Manhattan Project, the quest to harness the atom for peaceful purposes, and the response to the oil price spikes of the 1970s. Part of our job in the Office of Policy is to analyze and integrate the diverse policies that have emerged from these origins: our defense and nonproliferation programs; the cleanup at our weapons complex; our fossil, nuclear, and renewable energy programs; our energy efficiency programs; and our management of hazardous waste; and to help refocus our work to lead the nation in fundamental science and in the utilization of Cold War-related technologies.

The Policy Office has both domestic and international responsibilities. Domestically, we carry out many Departmental requirements set by Congress in the Energy Policy Act of 1992 and other legislation.

To achieve a well thought out and integrated approach to many of these national concerns, Congress has instructed the Department to issue periodic National Energy Policy Plans, the next one is due this year; the previous plan, the National Energy Strategy, was prepared largely by our Office and led directly to the bipartisan Energy Policy Act of 1992. Notably, we also implemented Congress' and the Administration's shared vision of voluntary action instead of imposing regulations to reduce greenhouse gas emissions. We did this by issuing guidelines for reporting to a database that records voluntary achievements and by launching a series of voluntary programs with industry and other interested parties, (e.g., Climate Challenge and Climate Wise). Internationally, we represent the United States in energy emergency management, promote U.S. energy exports and trade in concert with the Departments of State and Commerce, and manage the Department's foreign research and development agreements.

In the area of budget formulation and setting priorities, we work with the Chief Financial Officer's office to serve as the Department's "honest broker" — asking the tough questions that are not asked by those who have vested interests in any one program. Our Office is pivotal in helping the programs to set performance measures and mesh their objectives with the goals in the Department's Strategic Plan. Our strategic planning and budgeting role and evaluation of critical program issues have allowed us to help lead the Department's efforts in aligning and streamlining assets, eliminating redundant activities, and formulating the proposal to cut $14.1 billion over five years. These efforts are bringing you a leaner, more effective Department of Energy, at relatively low costs.

OVERVIEW

The FY 1996 Departmental Administration budget request of $31.1 million for the Office of Policy supports a personnel level of 195 Full Time Equivalents (FTEs). We have also requested $3.6 million for emergency planning, which is handled by the Interior Appropriations Subcommittee. This request reflects an increase of $3.9 million over the FY 1995 appropriation to include: an increase of program direction of annualization of the FY 1995 locality increase and pay raise, the partial year effect of the FY 1991 locality increase and pay raise, less a decrease of one FTE. This request maintains compliance with the President's Administrative Savings Initiative, and includes a decrease in support services; increase in Policy Analysis, and system studies to support the expanded role in policies regarding national security, strategic planning, DOE program evaluation, and international affairs; and an increase in environmental policy studies to address the impacts of environmental laws, regulations, and issues, as well as technology transfer issues and analysis.

OUR ACHIEVEMENTS AND COMMITMENTS

The business of the Office of Policy can be described by the following six themes:

(1) Implement Congressional Directives and Formulate Administration Energy, Environment, and Science and Technology Policy, (2) Encourage the Development of Competitive and Reliable Energy Options, (3) Fuel U.S. Competitiveness through Energy Technology Export Policies, (4) Sustain U.S. Productivity Through Science and Technology Policy, (5) Reduce the Nation's Nuclear Danger, and (6) Lead the Effort to Reinvent DOE.

To successfully achieve our commitments in FY 1996 with regard to these themes, we will need funding to support not only our human and travel resources, but the tools and analysis on which we must depend to perform our primary policy businesses.

ACCOMPLISHMENTS

Examples of our achievements this year and the priority tasks we will perform in FY 1996 include the following:

IMPLEMENT CONGRESSIONAL DIRECTIVES AND FORMULATE ADMINISTRATION ENERGY, ENVIRONMENT, AND SCIENCE AND TECHNOLOGY POLICY

Implement and support appropriate strategies developed in the National Energy Policy Plan. This year we will lead the Department's effort to develop and issue a National Energy Policy Plan, as directed by the Department of Energy Organization Act and supplemented by EPACT, that frames the policy choices on critical energy concerns facing the nation, including energy security. At Congressional direction, we are formulating a Least Cost Energy Strategy to accompany the National Energy Policy Plan that will clarify the costs and opportunities associated with meeting a group of energy objectives and priorities listed by Congress.

Over the past few months, also as directed by Congress, the Office of Policy organized and held regional town meetings and roundtable discussions around the nation, for the Secretary and other senior departmental and administration officials, to solicit public input on a broad range of energy issues. This customer and stakeholder input is being used to formulate the Department's energy policy.

Provide the analysis to inform the U.S. response to the U.N. Framework Convention on Climate Change. The importance of energy production and consumption in generating greenhouse gases requires that the Department play a central role in the U.S. Government's work on climate change. We champion flexible, voluntary initiatives, and realistic objectives and commitments in the domestic and international discussions and negotiations. The Policy Office assesses and evaluates the impacts of U.S. options to reduce climate change risks. With the availability of adequate analytical resources, we will improve capabilities to address employment and competitiveness impacts. We plan to develop and implement techniques to measure voluntary reduction achievements, expanding upon the use of the voluntary reporting database mandated by section 1605(b) of EPACT. We will also participate in the biennial review of existing emission reduction plans, and the initial evaluations of flexible strategies for the post-2000 period, (e.g., economic assessments of biomass fuels, enhance building and end-use efficiencies, follow-up to the *Car Talk Initiative*), and we will participate in ongoing international negotiations. Our past work served as the foundation of U. S. efforts in this area and has achieved widespread acclaim for its objectivity and appropriate use of state-of-the-art models, (which must continuously be kept available, updated and improved), and professional judgement.

Publish a Research and Development Management Plan for all DOE programs, as required by Section 2304 of EPACT. We will improve the integration of DOE's basic and applied research, as required under Section 2205 of EPACT. This year, the Department is playing a central role in defining the nation's energy policies and priorities for research and development through our voice in the Administration-wide National Science and Technology Council and its interagency committees. We will continue leadership in representing the Department in these groups.

Analyze and formulate the Department's policy positions on reauthorization of the Clean Water, Safe Drinking Water, and Comprehensive Environmental Response Compensation and Liability Acts, as well as positions regarding transboundary issues. These laws have been some of the most far-reaching in the nation's history, and reauthorization will impact, among others, the energy sector and the Department's cleanup of its weapons sites for years to come.

ENCOURAGE THE DEVELOPMENT OF COMPETITIVE AND RELIABLE ENERGY OPTIONS

Help to configure a domestic electricity industry that is more competitive, efficient, and less regulated. We will continue our work to facilitate dialogue and agreement among utility companies, the nation's state utility regulators and commissioners, ratepayers, the Federal Energy Regulatory Commission, (FERC), and other interested persons to achieve these industry outcomes, while assuring continued reliability, efficiency, diversity of fuels, equity and minimized emissions. As you know, landmark provisions of EPACT increased competition in electricity supply. Last year, the Office of Policy coordinated the Department's participation in formal proceedings on electricity industry restructuring and integrated resource planning at FERC and in New York, California, Maryland, and Florida. In these proceedings, we helped participants and decision-makers begin to shape a new industry structure that maintains incentives for reliable and clean electricity generation.

Support the Domestic Natural Gas and Oil Initiative to alleviate U.S. dependency on foreign oil. Our ongoing work to analyze the ban on exporting Alaskan North Slope crude oil will assist the debate on this important national economic issue. The Policy Office developed prototypical proposals, through our collaboration with the Maryland Public Utility Commission, for expanding the efficiency goals of competitive natural gas markets around the country. We are assisting in the establishment of industry cost-sharing in advanced computational research performed by industry at DOE national laboratories to advance the domestic production of oil and gas. To the same end, we are conducting a study of the costs and benefits of oil imports and we are analyzing the potential impacts of legislative and regulatory proposals to reduce the cost of domestic oil and gas production. We will continue our work with industry in the *Refinery of the Future Initiative* which encourages petroleum refiners to formulate individual approaches for achieving statutory environmental improvements.

Ensure that the potential national benefits offered by energy efficiency, renewable energy, alternative and clean transportation fuels are realized by federal programs in the most cost effective manner. The Policy Office contributes to this goal by providing analytical support for a wide range of Departmental programs to encourage or require energy efficiency improvements in buildings, energy using appliances and equipment, industry and transportation. For example, we review the impact of regulations and voluntary programs designed to improve energy efficiency in order to ensure that they achieve their intended purposes in the most cost-effective manner. We are undertaking a comprehensive assessment of the potential barriers to using large volumes of alternative transportation fuels. This analysis will be used by the Department to set alternative fuel use goals that will guide future programs to promote the use of clean alternative fuels. We are undertaking a major study of the costs and potential to improve motor vehicle fuel economy. We will continue to work with the Environmental Protection Agency to implement the reformulated gasoline program in a way that ensures continued supplies of gasoline at low prices. We will continue to respond to any potential problems using the rapid response procedures we have established with EPA to help States, affected industries and consumers continue to receive continued supplies of fuel if interruptions in the logistical system occur.

FUEL U.S. COMPETITIVENESS THROUGH ENERGY TECHNOLOGY EXPORT POLICIES

Promote the export of clean advanced U.S. energy technologies particularly to the biggest emerging markets. Over the past year, the Office of Policy helped plan and manage Presidential missions to India, Pakistan, and China led by the Secretary. These missions helped generate private sector partnerships for energy projects with a total value exceeding $10 billion, and helped establish a U.S. foothold in the multi-trillion dollar Asian energy market. Each trade mission has follow-up action plans to ensure that policy dialogues are sustained and to overcome barriers to increased investment and trade. This year, we led an interagency and public\private process that led to the sustainable energy initiative adopted at the Summit of the Americas; implementing this initiative will set the stage for increased investment in energy efficiency, renewables, and natural gas in the Americas, primarily involving U.S. companies. We also implemented ten major Interagency Trade Promotion Coordinating Committee programs to increase U.S. energy and environmental technology exports, in support of the National Export Strategy.

Represent U.S. interests in international trade negotiations affecting energy-related trade, such as last year's revisions to the General Agreement on Tariffs and Trade. These revisions will allow U.S. companies to fairly compete in the $3-$5 billion European electricity market. Furthermore, we will be involved in analyzing the role of trade and the environment.

Advance democratization and privatization in Russia through support of the Gore-Chernomyrdin Commission's energy work. We are working with Russia to develop a body of energy law that will allow U.S. firms to help reverse the decline in Russian oil and gas production, providing a fertile opportunity for U.S. exports and investment and helping ensure world alternatives to increasing reliance on Persian Gulf Oil. We have implemented a program to support the Russian electric power industry's privatization efforts. The program includes technical exchanges, cooperation with U.S. electricity executives to provide mentoring on management issues, and engaging the international financial community on electric power project finance for specific Russian project proposals involving U.S. firms. We have established and will continue to support an Oil and Gas Center in the producing regions of Siberia to attract Russian industry to the best U.S. technology and we are promoting policies and U.S. products to make energy efficiency - a grossly neglected resource - a central part of Russia's energy strategy. We are working with Russia to develop power alternatives that will allow Russia to shut down the plutonium based weapons production reactors at Tomsk and Krasnoyarsk.

SUSTAIN U.S. PRODUCTIVITY THROUGH SCIENCE AND TECHNOLOGY POLICY

Formulate a Science and Technology Strategy through our scrutiny of the Department's multibillion research and development portfolio, so that we can say with confidence that the scientific research we conduct with industry, universities, states and other partners provides a substantial return to American taxpayers and is in the national interest.

Lead the Department's effort to implement the White House National Environmental Technology Strategy. For the first time, we will align Federal energy and energy-related environmental technology programs across agency boundaries. Through dialogue and meetings we initiate with other agencies, we will address the critical ties between energy and the environment, with a focus on cost-effective pollution prevention rather than expensive cleanup. This is an important step toward focusing Federal efforts to accelerate the development and use of technologies with a high potential for lowering costs for protecting the environment - and to increase the exports of American goods. In preparation for this effort over the past year, we represented the Department in planning the White House Conference on Environmental Technology to advance the Administration's goals in sustainable development.

REDUCE THE NATION'S NUCLEAR DANGER

Lead the policy effort to bring under control the world's supply of plutonium and other weapons-grade materials. We will continue working with the International Atomic Energy Agency (IAEA) to promote openness programs to inspect excess fissile material in the U.S. and abroad. This year the Office of Policy participated at senior levels in U.S. discussions with North Korea to place their spent reactor fuel in safeguarded canisters, as part of international nonproliferation efforts and supported efforts in Russia and Ukraine to close down unsafe reactors.

Develop policies to maintain a safe and reliable U.S. weapons stockpile and a U.S. defense posture that will deter foreign aggression. We will continue to conduct analysis on the Department's policies in relation to controlling an inventory of excess fissile materials from dismantled weapons that has doubled in size over the past year.

LEAD THE EFFORT TO REINVENT DOE

Revise the Department's Strategic Plan affected by budget realities, progress on achieving Departmental goals, recommendations of Departmental advisory boards and new policy considerations. The Strategic Plan, completed in April 1994, guides the Department's decisions in setting priorities in this atmosphere of constrained resources. As part of this revision, we will augment the Plan by adding an international component that sets priorities, increases efficiencies and improves effectiveness in achieving the Department's international energy, science, security, and trade goals, which directly affect our domestic goals. In conjunction with this revision, we will continue to refine our budget formulation process, ensuring that resource allocations are based on current policy priorities. We will report updated performance measures to strengthen the accountability of internal management practices and communicate progress in achieving the Department's commitments.

Complete and Maintain a Baseline Inventory of all DOE Material and Facility assets. The Policy Office is compiling the Department's first comprehensive inventory of nuclear and non-nuclear assets, as well as non-DOE materials for which we have residual responsibilities. We will continue data collection and analysis of the impacts in order to lead to informed decisions on the disposition of these inventories. The size and complexity of these inventories involve 21,000 facility assets and over 1,382,000 tons of chemicals, scrap and unclassified nuclear and related materials. The Department is also responsible for at least 1 billion cubic meters of contaminated soil and water. For instance, at the DOE's Hanford site, about 440 billion gallons of contaminated liquids were dumped to the soil--enough to create a lake the size of Manhattan, 80 feet deep. Waste materials exceed 2,272,000 cubic meters with additional waste being generated annually. The Department's commitment to eliminate redundant and outdated activity requires either divestiture or appropriate reuse of existing surplus inventories. The Department anticipates that this work will identify well over $1 billion in annual inventory expenses.

In conclusion, I will point out that the President's directive to save $14.1 billion at the Department over the next 5 years means we are coming upon a era of radical transition. As the Department realigns and questions the national benefits of each of its programs, our policies must be increasingly well thought out and our decisions based on the best possible analysis. More than ever, the Office of Policy has a critical role serving as a catalyst for change. With your support the Office of Policy will help promote and guide this change.

Statement of Michael G. Gauldin
Director of Public and Consumer Affairs
Department of Energy
Fiscal Year 1996 Appropriations Hearing

Mr Chairman and Members of the Subcommittee, I appreciate this opportunity to discuss the FY 1996 budget request for the Office of Public and Consumer Affairs.

DOE has a new defined vision and comprehensive strategic plan, which identifies key business priorities and strategies to reach the department's goals, and to measure progress. Through a comprehensive strategic planning process, the department must now focus on new goals: fueling a competitive economy, improving the environment through waste management and pollution prevention, reducing the nuclear danger, and sustainable energy development.

This plan identifies five "business niches" that most effectively utilize and integrate the department's unique scientific and technological assets, engineering expertise, and facilities, economic productivity, energy resources, science and technology, national security, and environmental quality. These efforts are critical to the success of the Department. We believe that only by working hand-in-hand with the public in an environment of mutual trust and honest communication can the Department achieve its missions of energy security, nuclear nonproliferation, clean-up and economic growth through technology. Therefore the public needs a clear understanding of our missions and how they can participate in making the decision that affect their futures.

ACCOMPLISHMENTS

As Director of Public and Consumer Affairs, my primary goal is to meet the Secretary's commitment to the public by ensuring effective communications with the Department's customers and promoting a spirit of openness and trust in all communications. My modest budget includes overall increases or decreases as reflected below.

OVERVIEW

The budget request for the Office of Public and Consumer Affairs for FY 1996 is $4,386,000. This includes $4,248,000 for salaries and expenses for 55 full-time equivalent positions. The increase in salaries and benefits reflects an increase of one FTE plus the full effect of the FY 1995 locality pay increase, payraise and the partial year effect of the FY 1996 locality pay increase and payraise.

A total of $138,000 is divided between Consumer Affairs $46,000 and Public Affairs $92,000 for program support. This represents an increase in public affairs to maintain the FY 1994 operating level which supports the Secretary's commitment to openness and changing DOE focus. These funds are necessary for transmitting news releases to major news bureaus; for the evaluation and purchase of audiovisual products and publications; and for the dissemination of consumer information through radio announcements and newsletters.

Mr. Chairman, some of my specific efforts reflected in the key communications messages for the Office of Public and Consumer Affairs for 1995 are strategic alignment combined with the Department's business lines; comprehensive reform of DOE's contracting system; form a stronger partnership with stakeholders; review process to bring skyrocketing of legal costs under control; through training, offices are brought to a high-level of quality management; and our streamlining and reinvention initiatives are in place.

Let me close by stating that the Office of Public and Consumer Affairs is committed to carrying out its mandate within the approved budget structure. We look forward to being responsive to you and your constituents, the American public, with information about the Department's policies and programs in a forthright and timely manner. This concludes my presentation.

STATEMENT OF
ROBERT R. NORDHAUS
GENERAL COUNSEL
DEPARTMENT OF ENERGY

FY 1996 APPROPRIATIONS HEARING

Mr. Chairman and members of the subcommittee, I am pleased to present the fiscal year 1996 budget request for the Office of General Counsel.

Our office provides legal advice and support to all the programs and activities of the Department of Energy, with the exception of the Federal Energy Regulatory Commission. Despite increased responsibilities, the overall budget request for the Office of General Counsel is not significantly changed from the FY 1995 amount. The portion of the budget funded under the Energy and Water Development appropriation will increase over FY 1995 amounts to reflect increased staffing requirements and related salary and benefit costs. (This increase is largely offset by a decrease in the office's regulatory enforcement activity funded under the Interior and Related Agencies appropriation.)

This statement describes the activities of the office that are carried out under the Energy and Water Development appropriation.

The Office of General Counsel provides significant legal advice and support to a wide range of Departmental programmatic activities, in addition to its support for particular Secretarial initiatives such as contract reform, and regulatory streamlining. More specifically, initiatives by the Department necessitate increased staffing and resources in the areas of class action and other health and safety related litigation, administrative litigation, rulemakings, Freedom of Information Act issues, procurement and dispute resolution. The Department's requirements for support by the office is significantly expanding. We intend to continue to provide quality legal counsel with a minimum of additional cost, by shifting staff from the regulatory enforcement program to meet these new requirements.

The Office of General Counsel plays an active role on the Secretary's Contract Reform Team and assisted in the development of guidelines to implement contract reform initiatives. These reform efforts require either recompetition or renegotiation of major contracts, thereby requiring extensive legal involvement in negotiating, drafting, interpreting and implementing required contract clauses. As the Department continues to implement the recommendations of the Contract Reform Team, we expect work in this area to increase significantly. We also provide support to all of the Department's contracting and procurement activities. These activities have grown, as the office has begun assisting the program office in efforts to prevent the lodging of bid protests which delay procurement actions, and defending the Department when prevention is unsuccessful.

In connection with contract reform initiatives, we have implemented new procedures and significantly increased monitoring and control of contractor litigation, in particular class action lawsuits. Such lawsuits often involve complex litigation based on allegations of personal and property damage caused by environmental contamination connected with the Department's weapons production facilities, along with recent claims relating to the disclosure of past human radiation experiments. As we progress in this area, we will need to commit considerable resources to audit and contain the legal expenses incurred by contractors, which in recent years have been in excess of the entire Office of General Counsel budget. Our preliminary estimates indicate that these initiatives already have resulted in significant reductions in litigation costs. In the longer run, we believe devoting this additional attention to litigation management will result in very substantial savings to the Government.

The office has substantially increased its work in several areas of administrative litigation. Increased legal resources have been devoted to analysis and treatment of claims against the Department relating to equal employment opportunity, personnel security matters, and whistleblower complaints. This is in addition to our continued program of participation in State utility ratemaking proceedings affecting the Department's facilities. Since 1981, our interventions in these proceedings have resulted in savings of $47 million to our facilities. Currently, we are representing Departmental facilities in utility cases where they face potential cost impacts of $6 million annually. We continue to support the Department by participating in other public utility commission and Federal Energy Regulatory Commission proceedings in which the Department has a policy interest, for example, the recent California Commission's proposal that would restructure the electric utility industry.

The office has also been instrumental in implementing the Secretary's regulatory streamlining initiatives. The Energy Policy Act of 1992 and developments in the nuclear safety area have required significant increases in rulemaking activity. One of the Secretary's goals is to provide for completion of complex rulemakings in under two years. To accomplish the Secretary's goals, we have centralized in the Office of General Counsel rulemaking support functions that had been scattered throughout the Department and for which additional resources and staffing are required. Also in response to a Secretarial initiative, we have added an Office of Dispute Resolution to carry out the Department's commitment to alternative dispute resolution mandated by the Administrative Dispute Resolution Act of 1990. This office also requires the commitment of additional resources and staffing. We believe this is a cost-effective commitment because the Alternative Dispute Resolution program will result in significant reductions in litigation costs.

An area of substantial activity for the office is the legal advice and support it provides to the Department's Environmental Management program. This support encompasses a broad array of issues and activities, including environmental compliance and cleanup matters, workforce restructuring and transition issues, and oversight of contractors to assist in these efforts. My office assisted in the effort to streamline the Department's process for addressing its compliance with the National Environmental Policy Act, and will continue to work on improvements in this area. As the Department continues to assess its needs and focus on activities relating to environmental remediation, this office also will need to enhance and devote additional staff resources to environmental matters.

In conjunction with environmental restoration activities, we provide legal support to the Department in its ongoing efforts to reconfigure the nuclear weapons complex. These efforts give rise to a variety of legal issues impacting national security and nonproliferation activities, as well as workforce and public health interests. The office has been assisting the Department as it seeks to implement its enforcement responsibilities under amendments to the Price Anderson Act by drafting new regulations and interpreting existing regulations. We have also assisted countries in Eastern Europe and the Former Soviet Union on nuclear safety matters. The office continues to provide legal advice on efforts to carry out the Nuclear Waste Policy Act of 1982, as amended, and achieve greater progress in the civilian radioactive waste management program.

This office provides legal advice and assistance to the Department as it continues to implement the Energy Policy Act of 1992, which requires among other things the establishment of new programs and initiatives in the area of energy efficiency and renewable energy. These initiatives have generated extensive increases in rulemaking activity, for which this office will continue to provide substantial support. In addition, we have assisted the Department with implementation of the Climate Change Action Plan. We also assist the Clean Coal Technology Demonstration Program, one of the Department's largest efforts of cost-shared financial assistance to utilities and private industries.

A staple of this office's support to the Department and the Secretary is its defense of the Department's activities in judicial and administrative litigation. During the past year, our attorneys, in conjunction with the Department of Justice, have represented the Department in a number of significant lawsuits, including environmental lawsuits, tort actions, and employment related litigation.

We will be providing legal support to the Department's Domestic Natural Gas and Oil Initiative, as well as ongoing activities of the Strategic Petroleum Reserve and Naval Petroleum and Oil Shale Reserves. We assist the Department's participation in international activities, including science and technology cooperative agreements, and also provide advice on major international agreements. This office will assist the Department in implementing relevant portions of the General Agreement on Tariffs and Trade. The office often acts as the Government's antitrust monitor for Industry Advisory Board meetings of the International Energy Agency.

The Office of General Counsel provides legal analysis and advice to all elements of the Department with respect to the requirements of the Administrative Procedure Act. We prepare annual and semi-annual compilations of planned and ongoing regulatory activities throughout the Department and coordinate implementation of President Clinton's Executive

Order 12866, Regulatory Planning and Review. We have been providing increased support to the Department in processing requests under the Freedom of Information Act, particularly in light of greater access and interest by the public in the Department's past and current activities. The office also administers the Department's financial disclosure and standards of conduct programs.

Finally, this office provides legislative support and drafting services for a wide variety of Department, Administration, and Congressional initiatives, such as legislation to implement the President's budget.

With this budget request, we believe the office can provide the sound counsel and legal services required by the Department.

WEDNESDAY, MARCH 8, 1995.

ENVIRONMENT, SAFETY, AND HEALTH

WITNESS

TARA J. O'TOOLE, ASSISTANT SECRETARY, ENVIRONMENT, SAFETY AND HEALTH

OPENING REMARKS

Mr. MYERS. The committee will come to order. The committee is pleased today to have, once again, Dr. O'Toole from the Office of Environment, Safety, and Health at the Department of Energy. Your prepared statement will be included in the record, and you may proceed as you care.

Dr. O'TOOLE. Thank you, Mr. Chairman. Well, I have about five minutes worth of opening statement, if that is okay, then I would be pleased to take your questions.

The Office of Environment, Safety and Health at the Department of Energy is the Department's principal source of expertise and experience in the technical fields dedicated to protecting the environment, ensuring the safety of our special nuclear materials and safeguarding the health and safety of DOE employees and the public who live near our facilities.

Since we addressed this committee last year, the Office of Environment, Safety and Health has fundamentally reorganized. I believe we are more efficient and streamlined, but more importantly, our work is now focused very directly on prevention of accidents and illnesses and pollution at the dozens of DOE sites throughout the country, particularly those that make up the nuclear weapons complex.

I am going to seek today to try and convince you that the Office of Environment, Safety and Health is not just another government office that moves paper and formulates paper strategies in Washington, D.C. Our office is the principal corporate resource, the principal source of health and safety professionals in the Department of Energy dedicated to making it safer to work within or live near the government's nuclear weapons facilities.

Now, convincing you of this is something of a familiar situation for me. As a practicing physician, I often had to try to convince patients to invest in good diet or exercise or blood pressure control before they had a heart attack or stroke, and what I am going to try to convince you of today is that the $222.6 million, that is million not billion, dollar investment in the Office of Environment, Safety and Health is also a good investment, and, indeed, I believe a bargain.

HAZARD CATEGORIES

Now, the Defense Nuclear Facility Safety Board has said that the nuclear weapons complex presents more dangers now than it did even at the peak of nuclear weapons production. I believe that is true, and I believe the perils the weapons complex presents are growing. We face three large categories of hazards.

First of all, there is the environmental contamination that as a result of past operations and waste management practices is now loose in the environment. This includes, for example, several hundred thousand pounds of mercury in the soils and sediments and waterways of Oak Ridge, several billion cubic feet of radioactive contaminated soil at Hanford and Idaho and elsewhere, many more instances of pollution that pose potential health threats to the populations around these sites and to those who will do the work of cleaning up.

The second category of hazards is the vast inventories of hazardous materials, fissile materials and chemicals that have accumulated since the end of the Cold War. When we stopped manufacturing nuclear warheads, we ceased recycling plutonium, highly enriched uranium and the spent fuel into new warheads, and much of that material is now lying in situations and conditions that were never intended for long-term storage. We have over 26 metric tons of plutonium throughout the weapons complex, for example, in plastic baggies and cans that are not safe for the long term. We have over two million kilograms of spent fuel in pools that are leaking and are not safe for the long term. In addition, we have thousands and thousands of tons of chemicals that have not been attended to with the kind of practices that one would expect from the private sector, for example.

The third category of hazards constitutes the aging and decrepit facilities themselves. We have 4,000 or so structures left over from World War II or thereabouts that are in poor condition. They have not been well maintained. They lack the updated safety systems one would expect of nuclear facilities in the 1990s. In the last couple of years, for example, we lost one worker who fell through a faulty roof, another employee at Hanford was fatally burned when a brittle steam valve exploded in his face. The decontamination and decommissioning of these facilities is going to combine the threats from the construction industry, which are quite significant, with the potential exposure to hazardous materials and radionuclides.

PRIVATE SECTOR SAFETY PRACTICES

One important feature of the nuclear weapons complex that was operated at the height, and indeed throughout the length of the Cold War was its culture of secrecy and isolation. This was a necessary national security requirement at the time, but acted to insulate those facilities from the practices of the private sector and indeed the expectations that the public put on the private sector and the realms of environmental protection and safety protection.

Our aim in the Office of Environment, Safety and Health is to imbue DOE with the best practices from private corporations and to borrow and apply the preventive approaches that the private sector uses to health and safety problems in the Department of Energy. If you look at private sector corporations who are best in class in health and safety and environmental protection, you invariably see two features in all of them, Dow Chemical, Mobil, it doesn't matter.

First of all, in all of these best performers the managers manage safety, safety isn't a burden. It isn't something that is left to the pointy-headed professionals with degrees after their names. Every line manager manages safety as assiduously and carefully as he manages the bottom line. He tracks it, he knows what is going on, he pays attention to it and he is rewarded accordingly for his efforts and performance.

The second feature that you see in all best of class corporations is the workers in these businesses are actively participating, identifying and fixing hazards. If you don't have the people who have the most to gain or lose from safety participating, you just don't make headway. You have got to have the workers trained and involved.

ENVIRONMENTAL, SAFETY AND HEALTH ORGANIZATION

Everything our office does is aimed at furthering one of those two features—helping managers to manage safety more effectively or getting workers actively participating and identifying and fixing hazards. If I may, I would just like to quickly run through the different offices of the Office of Environment, Safety and Health, and give you a thumbnail sketch of what each does.

The Office of Oversight, which in the past consisted of six separate entities, each of which went out and did serial assessments and evaluations of occupational safety, nuclear safety, industrial hygiene, security and safeguards and so on and so forth, generating long lists of noncompliances and problems. That was seen as very burdensome to the field. It also did not give managers any overview or big picture sense of priorities or solutions. We have changed that.

We have taken all six offices that did oversight and put oversight solely in one Deputy Assistant Secretary's purview. We will now do multidisciplinary assessments, focused on the effectiveness and comprehensiveness of the management systems in DOE devoted to safety and health. These assessments should be a very useful tool to help managers set priorities and allocate resources.

MANAGEMENT TOOLS FOR SAFETY CONCERNS

Another example of how the Office of Environment, Safety and Health is developing tools to address health and safety issues and solutions to problems lies in our Office of Worker Health and Safety. In the past DOE has had very few management systems available to track environment, safety and health programs to ensure accountability.

We have been working very hard on contract reform to make sure that explicit expectations for safety performance is written into the contracts that we have with our management and operations contractors. We have also devised a three-year plan that helps DOE's line managers, such as Tom Grumbly in the Office of Environmental Management or Vic Reis in the Office of Defense Programs to align their own high risk environment, safety and health issues against their budget so that they can track and visibly see whether or not their budget monies are going to their high-risk priorities.

That exercise in fiscal year 1996 resulted in $61 million being put back into high-risk, high-priority activities that had gotten defunded by the line managers simply because they didn't understand or couldn't easily see the health and safety necessity of these outlays.

HANFORD TANK FARMS

When I came to the Department of Energy, we encountered a number of disturbing incidents at the Hanford tank farms. These tanks, of which there are 177, contain over 60 million gallons of high-level radioactive waste. Sixty-six of these tanks are leaking and we have had a number of instances of worker exposure to unidentified chemicals emanating from these tanks. We put a number of very experienced health and safety professionals, mentors, as we call them, side by side with the DOE managers at the tanks, and since we have done that, the incidence statistics for safety problems with tanks have decreased by 56 percent in the past year.

Those mentors have also proposed changes in the way we sample the waste in the tanks, which is going to save us about a million dollars in sampling costs, and we have saved about $350,000 in radiation monitoring costs, again, because of ideas the mentors promoted for doing it smarter and better and more efficiently. We have also partnered with the Office of Environmental Management to establish consistent and efficient approaches to protecting cleanup workers at the weapons complex.

VULNERABILITY ASSESSMENTS

Many of these approaches were borrowed from industry and the best of practices at DOE sites, and we are rapidly testing and putting them into place in the field. For example, we have drawn on the best industry experience in responding to many of our chemical vulnerability problems and have used processes and models developed by the Chemical Manufacturers Association so that we expect to be comparable to the best performers in industry within five years.

Our Office of Nuclear and Facility Safety led two landmark vulnerability assessments, one on the condition of spent fuel at the weapons complex, another on our plutonium vulnerabilities. They completed each of these studies in less than six months and provided managers with an invaluable road map to high priority issues involving these fissile materials, road maps which resulted in significant shifts in resources and priorities within DOE.

The Office of Nuclear Safety has also done many special studies of operational issues requested by line managers, such as a study of plutonium processing at the Savannah River site.

HEALTH STUDIES

We are asking for an increase in our budget for the Office of Health Studies this year. This office is devoted to medical surveillance. That is the process of detecting exposures to radionuclides or hazardous material before they become diseases in workers. And also to epidemiologic studies which form our understanding of what went on in the past and hence are the basis of our preventive strategies for avoiding diseases among workers and populations exposed to environmental toxicants in the future. We now have over 65,000 workers entered into epidemiologic studies, former DOE workers, that is, and we have significantly revamped the Medical Surveillance Program that is required of us by the FY1993 Defense Authorization Act to make it leaner, meaner, and, I think, more oriented toward prevention than it has been in the past.

INTERNATIONAL HEALTH STUDIES

We are also engaged in some very important international studies, including the Radiation Effects Research Foundation, which is the study of the atomic bomb survivors, and forms the basis for most of our radiation protection standards. We also have a number of very important scientific investigations underway in Russia, Ukraine, and Belarus where we are seeking to understand the importance of the Chernobyl accident as well as study the effects from environmental pollution and occupational exposures at the Russians' Hanford equivalent, the Chelyabinsk site in the southern Urals.

OFFICE OF ENVIRONMENT

Our Office of Environment has long been a valuable source of guidance to DOE managers on our environmental laws. Last year, this office led the reform of our approach to the National Environmental Policy Act. We pushed decisionmaking way out into the field. We gave field office managers in DOE authority to sign and approve environmental assessments and we have already seen faster, less expensive environmental impact statements and environmental assessments issued from this reform, and we expect to see more and more pay back in the following years. That is a quick sketch of what we do, Mr. Chairman. I would be happy to answer questions.

[The prepared statement of Dr. O'Toole appears at the end of the hearing record.]

BUDGET REQUEST FOR FY 1996

Mr. MYERS. Well, thank you, Dr. O'Toole. This committee has a great many doctorates up here before us. It is nice to have someone who can do something for you.

Dr. O'TOOLE. I hope your faith is not unfounded.

Mr. MYERS. I will tell the story again, I tell it so often. Years ago when I worked for a living, I was a country banker, and I would have about this time of year an overview for the farmers around of what Purdue University could expect from the economy for agriculture, and I often had Dr. Earl Butz. So on one occasion a room about this size, had about 40 or 50 farmers there, so I introduced Dr. Butz as Dr. Earl Butz, Purdue economist from Purdue University, and went down and sat down. So Earl gets up and he tells lots of stories. His stories got him in trouble finally, but he was telling stories, and I was sitting between two farmers.

One farmer reached over and said, "Is that fellow up there a real doctor?" The other said, "Yeah, but he ain't the kind that can help you any." So I often kid Earl about it. Earl is still living and a constituent of mine. But anyway we are pleased to have you.

Last year, you were unable to testify before us even though you had the job. It is good to see someone that is official. We have so many acting. It seems like every group has a bunch of acting assistant secretaries, so it is nice to see that someone had confidence to appoint you to be full-time.

Dr. O'TOOLE. Thank you, Mr. Chairman.

Mr. MYERS. At least for another two years.

Dr. O'TOOLE. There are some days when I wish I were not official, but——

Mr. MYERS. We all have those feelings. As we discussed the other day, I have some problems deciding which pocket you put money into here. An example here in energy supply and research you have environment, safety and health planned request for $150 million. You go down to nuclear safety policy, what is the difference between nuclear policy? Is that what you have been talking about this morning? Policy is where you direct someone and they have the absolute responsibility, could you explain what the difference is?

Dr. O'TOOLE. Our budget comes from many different sources and is impossible to follow unless you have the secret code that has grown up over time as a consequence of the way various committees have allocated funds.

Mr. MYERS. Pardon me for interrupting you. Years ago when Tom Bevill and I came on the Committee on Appropriations, why didn't every agency use the same format for budget requests? We have been asking for that, and we don't ever seem to get it. Okay. Go ahead, I am sorry. It would be a lot simpler for us who don't have doctorate degrees.

Dr. O'TOOLE. Those don't necessarily help you in these waters. To answer your question, yes, policy is one of the functions we are charged with since we are self-regulating in areas of nuclear safety and occupational safety and health and developing the DOE policies in those areas. For example, we have been developing nuclear safety rules and policies related to occupational safety, construction safety and so forth, so those are amongst our functions.

MARSHALL ISLAND

Mr. MYERS. The Marshall Island program under weapons activities, could you explain to us what your program is there? I think I know, but would you explain to the committee?

Dr. O'TOOLE. Sure. We do environmental sampling and monitoring in the Marshall Islands as well as medical surveillance of the Marshallese who were exposed to fallout as a consequence of the Bikini tests in the South Seas in the 1950s. That, of course, was a Department of Defense exercise and the money for those activities comes to our office through Defense Programs, but it is solely devoted to medical surveillance and environmental monitoring.

Mr. MYERS. Have you come to any conclusion?

Dr. O'TOOLE. About the Marshallese?

Mr. MYERS. Yes, individuals affected by the test blasts.

Dr. O'TOOLE. There is in the medical surveillance data at this point indications that the Marshallese have what seems to be an excess of thyroid nodules, not malignant thyroid nodules, but benign growths, which may or may not be related to their fallout.

Part of the problem is we do not have good data on what normal populations experience when they are having regular tests and examinations of their thyroid. It may be that we are looking harder and finding more or they may indeed be related to the fallout experience of these individuals.

RADIATION EFFECTS RESEARCH FOUNDATION

Mr. MYERS. I think I read a few months ago something about a change of policy of the Japanese, at Hiroshima and Nagasaki, the testing you do there. Has there been some recommended change in the testing or who is going to conduct the tests? Am I mistaken about that? I think I read something.

Dr. O'TOOLE. In the Marshallese?

Mr. MYERS. No, I am talking now about the Japanese program, the radiation effects from those two blasts.

Dr. O'TOOLE. The RERF, the Radiation Effects Research Foundation, has been in existence since the 1950s, and this is a joint enterprise of the U.S. and Japan.

Mr. MYERS. But no change?

Dr. O'TOOLE. No.

Mr. MYERS. I thought I read there was some change.

Dr. O'TOOLE. The change that you may be referring to doesn't have to do with the science. The National Academy of Sciences has been the pass through, if you will, the middle manager of those monies for the Department of Energy. They have administered the funds to Japan, and they have helped fund the American directors of the RERF.

The National Academy has not been involved in directing the research agenda or doing the science. What we would like to do in the next year is open that management position of RERF to competition from all American universities. The reason for this is the acute need to develop a new generation of radiation health effects researchers. For a lot of reasons, having to do with the attraction of molecular biology and other fields of scientific endeavor, and to some extent, the difficulty of doing radiation health effects research.

We don't have many young researchers who do radiation health effects research, and we need them. DOE certainly needs them, as we engage in this massive cleanup that we have begun, but the world needs them, and our intention was by making a university the middle manager, if you will, to get more young graduate students and young researchers going to Japan and engaged in the RERF research and heighten the interest in these fields of endeavor, but that is the only change. There will be no change in the research agenda, no change in DOE's involvement in RERF.

TAMOXIFEN TESTING

Mr. MYERS. Could you briefly describe what we are doing in Russia with Chernobyl? My question is this. Well, three years ago we started a test with Tamoxifen. They have had a lot of success with animals with Tamoxifen, preventing breast cancer and some other cancers too, possibly, but it is still under test in this country.

We started three years ago a seven-year test on the effects and the success of Tamoxifen with some 10,000 women, and we tried to get the same thing. Why don't we go to the Chernobyl area where we do know these women have been exposed and provide the Tamoxifen for them where we could get a perfect test to see the effects of Tamoxifen on a population so severely exposed, but we couldn't get it off the ground. Tamoxifen is expensive, but what a perfect test for both the manufacturer as well as for science. What can you tell us about what we are doing in Chernobyl now?

Dr. O'TOOLE. Well, you are quite right. The unfortunate accident of Chernobyl and the pollution around the former Soviet Union's weapons complex present a whole array of potentially very, very valuable scientific endeavors. It is very difficult to do scientific research in the former Soviet Union right now, in part because of the chaos that they are in, and the terrible stress that their scientists are under, and in the Chernobyl studies we are focusing, first of all, on thyroid cancer and thyroid disease because we know or we strongly suspect that there is a link between the radiation released by Chernobyl and the consequent thyroid disease in the population.

CHELYABINSK STUDIES

Also, we have been striving to partner with the Russians in these studies and rather than tell them what our research agenda has been, we have been seeking to enlist their cooperation in formulating a mutual research agenda. This was one of the things that they wanted to do. The Chernobyl study, I mean the Chelyabinsk studies are potentially very, very valuable to science because this is a situation where the pollution wrought by their weapons production, which outstrips anything in this country, presents a situation where people have been exposed to moderate levels of radiation much higher than our workers in our weapons complex have experienced, for example, but much lower than those suffered by the atomic bomb survivors. So it is this mid-level dose of radiation, and its consequences that we are very, very interested in, and the Russians seem to have data indicating that there are effects from those kinds of doses over a long period that have really never been noted in the western literature because we don't have those kinds of exposures.

So we are very eager to, first of all, preserve that data, which is all on paper—nothing is computerized and it is in buildings that are not fire proof—and secondly, begin to work with the Russians to devise a research agenda to explore a whole myriad of issues associated with those populations.

Mr. MYERS. Do you have any collaborative programs with the NCI or NIH?

Dr. O'TOOLE. Yes, we have collaborative programs in both Belarus and Chelyabinsk with NCI.

Mr. MYERS. Well, thank you. Mr. Bevill.

OVERSIGHT RESPONSIBILITIES

Mr. BEVILL. Thank you, Mr. Chairman. Welcome, Dr. O'Toole, a real doctor. In one of my economics courses they had a Ph.D., a Dr.

Whitman, a very brilliant man, but he told us about—the Chairman's remarks made me think of it. He told us about he overheard his mate answer the phone and he heard her say that, no, he is not a real doctor. He is one of those doctors that is no account, so that reminds me of it.

Would you clarify the ES&H oversight responsibilities for your organization, the program offices, and the field offices? Why is it necessary for each program organization at headquarters to have its own ES&H staff? Is it anticipated that your office will be the corporate resource with no need for multiple ES&H offices throughout the Department?

Dr. O'TOOLE. I think there has been an excess of environment, safety and health oversight in DOE in the past. As I said, our office has reorganized from six into one oversight entity. There still exists environment, safety and health overseers, appraisers, assessers in the line programs such as environmental management who are charged with understanding whether or not, for example, the environmental management people are doing what is necessary to protect health and safety.

Our office is the only one at DOE that is independent of the line functions. In other words, our people are not vested in the programs themselves, their budget does not come from the program budgets, so we have an independence that those program offices lack, which I think is important. I think that as much as the number of oversight offices has been problematic, the way we have done oversight in the DOE in the past has been a problem.

It is crazy to simply repeat the same audit again and again and again at different levels of the organization. That is very inefficient, and it doesn't get you useful information. What we should do is what corporations do and basically pyramid our audits so that at the higher headquarters level of the operation, what you are assessing is the effectiveness of the management systems. You know you go down to the deck plates and sample this valve or that one only to validate your findings. You don't just redo what auditors at different levels have already evaluated. We are in the business of doing that. But it has been very difficult in the past in DOE to maintain accountability of health and safety, and if you read the very lively and disturbing history of safety problems at the Department of Energy, you see that again, and again, and again, and again contractors have not been held accountable for poor performance in health and safety.

The answer to that is not more audits. The answer to that is contract reform, which our office has been very deeply engaged in, making sure you have explicit expectations of performance in ES&H for contractors and that you hold them accountable. The answer to that is management systems such as the three-year EH tracking plan that allows you to align in a program what you are spending your money on against what you think the risks are, so we need to do smarter, more efficient oversight, but we also need to put in place better management accountability systems if we are really going to get the job done.

Mr. BEVILL. So you do feel that there is some overlapping?

Dr. O'TOOLE. I think that some—yes, I think before we reorganized there were a lot of inefficiencies in the Office of Environment, Safety and Health.

Mr. BEVILL. We are getting a lot of reports and a lot of people who are testifying. There are several who have testified about the overlapping we have and so I am glad that you are aware of this situation and obviously, you are looking into it.

Dr. O'TOOLE. Yes.

CHANGING WORKERS SKILLS

Mr. BEVILL. You mention in your written testimony that the mission of the Department has changed in many ways. As you state, the Department now has new unfamiliar missions. You go on to say that these newer tasks are unfamiliar to most DOE workers and present them with highly dynamic and changing workplaces where hazards can be numerous.

How is your office and the DOE in general responding to these new challenges, especially in regards to the expertise and skills of your workers?

Dr. O'TOOLE. Well, one example of a new and fairly unfamiliar mission is the decontamination and decommissioning of the PUREX facility at Hanford. This is a vast facility that used to be called the Queen Mary because that is about how big it is in eastern Washington State.

We used to take spent fuel and put it in one side to get plutonium out the other end. These are called canyons because there are 4-foot thick cement walls between where you do the work and where human beings can be. Once you start these places up they are too radioactive to ever allow humans to enter again.

Our task is to get rid of that facility. So the first thing that you have to do is figure out what you left in place when you turned off the lights. We have a lot of chemicals, a lot of acids, a lot of radioactively contaminated equipment, a lot of radioactivity, and even some spent fuel in the bottom of that facility that you have to understand and that you have to very carefully remove it and put it someplace safe and then brick by brick dismantle the place.

That is a very different project than building a nuclear facility when you start with clean, uncontaminated materials, and you have plans for where you want to get to. The kinds of skill mix that you need to carry that out include, for example, industrial hygienists, people who understand chemicals and chemical exposures and can plot a safe way to get those chemicals out of there without harming workers or releasing the stuff to the environment.

My office, which is the corporate resource for these kinds of professionals, had three industrial hygienists when I got here. We have subsequently hired several more. But it is those kinds of skills and those kinds of missions that are different from the old weapons production operations that DOE engaged in quite successfully, I might add, in the past.

Mr. BEVILL. All right. I have some other questions I am going to submit here. I understand my time is up. Thank you very much.

Dr. O'TOOLE. Thank you.

Mr. BEVILL. Thank you, Mr. Chairman.

Mr. MYERS. Thank you, Tom. Mr. Riggs.

YUCCA MOUNTAIN SAFETY

Mr. RIGGS. Thank you, Mr. Chairman. We are so intimate here that we hardly need a microphone. Dr. O'Toole, I am sure you are familiar with the recent New York Times article on the Yucca Mountain complex. It was, as near as I could tell, reprinted verbatim in the Santa Rosa Press Democrat, which is my hometown in Sonoma County, California, over the weekend. It actually appeared on Sunday, March 5th.

With your indulgence and for the benefit of my colleagues on the subcommittee, I would just like to read the first few paragraphs before I pose my questions to you which will have to do with not only the safety of that facility, but the broader policy issue regarding plutonium disposal as we size down our nuclear stockpiles. Would that be acceptable to you?

Dr. O'TOOLE. Sure.

Mr. RIGGS. The article starts off saying:

> The debate has broken out among Federal scientists over whether a planned Nevada underground dump for the Nation's high-level atomic waste might erupt in a nuclear explosion, scattering radioactivity to the winds or into the groundwater or both.
>
> The debate, set off by scientists at the Los Alamos National Laboratory in New Mexico, is the latest blow to the planned repository deep below Yucca Mountain in the desert about 100 miles northwest of Las Vegas. Opponents of nuclear power and Nevada officials, have long assailed the project as ill-conceived and ill-managed. It has encountered numerous delays.
>
> Even if scientists can debunk the new argument that buried waste at Yucca Mountain might eventually explode, the existence of so serious a dispute so late in the planning process might cripple the plan or even kill it. Planning for the repository began eight years ago and studies of its feasibility have so far cost more than $1.7 billion.
>
> The Federal Government wants to open the repository in 2010 as a permanent solution to the problem of disposing of waste from nuclear power plants and from the production of nuclear warheads. The possibility buried waste might detonate in a nuclear explosion was raised privately last year by physicist Charles Bowman and Francesco Venery, both from Los Alamos, the birthplace of the atomic bomb.
>
> In response, lab managers formed three teams with a total of 30 scientists to investigate the idea and, if possible, disprove it. While uncovering many problems with the thesis, the teams were unable to lay it to rest, lab officials say, so the lab is now making the dispute public in scientific papers and is considering having it aired at large scientific meetings as well. "If we knew how to put a stake through its heart, we would do it," John Brown, head of energy research at the lab said in an interview.

I want to stop there and get your reaction to this particular article and the concerns that have been raised by the scientific community because it would seem to me that this could be a major and fundamental setback in our nuclear safety and nuclear disposal program.

Dr. O'TOOLE. Well, first of all, the Department sees its current mission at Yucca Mountain as deciding whether or not Yucca Mountain is safe, not proving that it is, okay. We could have an interesting hours long debate about whether or not DOE has, or will ever have, the credibility to make that decision, given its past history and involvement with nuclear energy and so on and so forth, but that really is what we are trying to do.

Among other things, we have asked scientists to think of all possible problems that might beset Yucca Mountain, and Dr. Bowman and his colleague were busily engaged on that task at Los Alamos. One of the problems with the issues that he raises about a potential criticality in Yucca is that his issues haven't been published anywhere. This has been a kind of, you know, inside the lab debate, back-of-the-envelope type thing that I gather has been going on for some weeks, but there is no published, let alone peer-reviewed, paper of Dr. Bowman's concerns.

Just as DOE has vested interest in the minds of some and credibility problems, I would point out that Dr. Bowman is the head of accelerator research at Los Alamos, which is, of course, the alternative disposal source that he is advocating instead of Yucca Mountain, so he may have some conflict of interest issues in terms of his scientific interest that I don't think have been clearly examined in public yet.

DISPOSING OF SPENT FUEL AND DEFENSE WASTE

The Yucca Mountain situation is very complex and very serious, and I think it rolls up a number of very important scientific and policy issues. First of all, what do we do—what do we do with the spent fuel and defense waste that we have generated over the past few decades? It is here. It is not going away. It is our responsibility as a Nation to do something that ensures the safety of that stuff.

Mr. RIGGS. May I just interject for a moment because I think you raise a profoundly important question, and just to point out that the article goes on to mention that last Wednesday, a week ago tomorrow, the President ordered substantial cuts in our stockpiles of weapons plutonium, but did not say what would become of that particular substance, so——

Dr. O'TOOLE. Well, it is going to be stored in vaults at DOE in the near term. And this is a problem. I mean, the end of the Cold War was a great thing, we would all agree, but it happened so suddenly that there were no plans in place two years ago as to what we would do with the legacy of fissile materials, plutonium prominent among them, that we had accumulated in 40 years, and I am not just talking about the plutonium that comes out of disassembled weapons, which is a lot of plutonium.

We also have 26 tons of bits and pieces and powders throughout the weapons complex that we used to recycle into new warheads that are now sitting in cans and baggies and buckets in rooms and in conditions that are not safe for years at a time. So we are digging out of this situation that we are in.

PLUTONIUM VULNERABILITY STUDY

The Plutonium Vulnerability Study that we did last year, I think, presents a very vivid picture of the kind of near term, i.e. next one to 10-year problems, that we face in the safety realm with these materials and also has provided a good near-term road map for what we have to do in the next two to three years. And we have already begun to do many of the corrective actions that are necessary. But you are right, the country does not yet have a long-term disposition plan for these materials. There is a planning process under way in the Department of Energy, but the solution has not yet been decided upon.

Mr. RIGGS. I would like to pursue this questioning further, but I know I have used up my allotted time for the first round. I would like to clarify. You referred, though, to a study. Is that the study by the National Academy of Sciences, the Plutonium Safety Study that you were just talking about?

Dr. O'TOOLE. No, the National Academy of Sciences did do a study on long-term disposition of plutonium, you are quite right, and technological options for that. The study I was talking about was done by my office, and it is the Plutonium Vulnerability Study talking about near-term environment, safety and health threats posed by plutonium at our facilities. I would be happy to get you a copy.

Mr. RIGGS. I would appreciate that. Thank you, Mr. Chairman.

Mr. MYERS. Thank you, Frank. The committee recognizes and is pleased to see the Close-Up students here. The thing this committee and DOE is trying to do is make sure that you and your children and your grandchildren will have an adequate, safe supply of energy supplies of various sources, so we are pleased to see you here. We hope you get something out of it. We hope we do, too. Thank you for coming today.

Mr. Fazio.

OFFICE OF TECHNOLOGY ASSESSMENT

Mr. FAZIO. Thank you, Mr. Chairman.

Welcome, Dr. O'Toole. I want to note you are a graduate of OTA, and I know that OTA is an issue that is on the agenda of this Congress in terms of its survival. I really believe strongly that we ought to maintain OTA. I think your stature enhances the image of an institution that, in my view, has sent a number of worthy graduates into further public sector participation, and if you would be interested in making a comment at all about the agency, I would be happy to hear it for the record.

Dr. O'TOOLE. Sure, I will be glad to take that opportunity. I loved OTA, and have never been in a more collegial and scientifically credible place, and I have been at Yale and Johns Hopkins and other esteemed institutions. I would also add that had we taken OTA's advice on spent nuclear fuel. We might not be at this juncture now, but it does give analytical advice, not political advice. That is both perhaps its value and its failing in these times, but thank you for those remarks. I do think it is a very valuable institution as well.

DEFENSE NUCLEAR FACILITY SAFETY BOARD

Mr. FAZIO. I asked Secretary O'Leary yesterday if she would respond for the record to the fusion study that was just completed by OTA, and she said she would do so. I wanted to ask you a little bit about the debate going on in Congress about risk assessment and other aspects of regulatory reform. That debate has focused sharply on alleviating the burden by requiring agencies to analyze the impact of their regulations before being promulgated.

I think there is general support for that. But I understand the Defense Nuclear Facility Safety Board is responsible for providing recommendations about safety issues that have a real impact on your budget. Is that fair to say?

Dr. O'TOOLE. Yes.

Mr. FAZIO. Could you tell me how much of your budget is really dedicated to dealing with issues that are raised by the board?

Dr. O'TOOLE. Well, my office contains the six people who are the liaison for the board. The defense board has about 150 people devoted exclusively to telling us what to do, and they can create a lot of work. Coordinating that across the nuclear programs in DOE has been something of a challenge, and those six people are basically trying to coordinate those efforts. That is about a million dollars in my office, which is only a small part of what the DOE as a whole spends, of course, on implementing safety board recommendations.

I really could not estimate what DOE spends on implementing the board's recommendations. It would be in the hundreds of millions of dollars category given all of the recommendations that have come in since the board began in 1990.

Mr. FAZIO. I am interested in exploring this because it may be that we have a case study here for questions related to the micromanagement of your budget by an independent entity. I am interested in knowing what you might have been doing that has been placed on the back burner because of the priority that must be given to decisions that the board makes that ultimately you have to implement.

Dr. O'TOOLE. Well, the implementation would be the responsibility of the line program offices, the Tom Grumblys and Vic Reises of the Department, not I, for the most part, with some exceptions. I think one of my—your question is very timely, actually because tomorrow we are convening the Federal Advisory Committee Panel that is seeking to advise us and the Congress on external regulation of DOE, whether or not we ought to cease this era of self-regulation and establish some entity with the capability of levying penalties on DOE for nonconformance with health and safety rules.

One of the problems with the board is it is devoted to nuclear safety, and half of all the fatalities in DOE sites since the dawn of the Atomic Energy Commission have been construction incidents. So that plus the sexiness, if you will, associated with radioactivity, I think, sometimes skews our priorities toward very high consequence, but low probability scenarios such as the possibility of an earthquake taking down a building at Rocky Flats, a situation in which we are poised to spend tens of millions of dollars correcting instead of implementing effective monitoring programs to prevent beryllium disease in people at Rocky Flats, which is a fatal disease that we know people are getting as a consequence, and we know how to prevent by preventing exposures. So that is my first concern, that the Board's emphasis on nuclear safety prohibits the kind of multidisciplinary approach that is really necessary in today's world.

I think the lack of any opportunity to investigate the cost implications and the relative benefits of the Defense Board recommendations is also a negative which we could change if we had the statutory authority to change the way we deal with the Board. Most regulators have a period for public comment after they suggest a rule or a proposal.

We have 45 days to respond to a board recommendation, and although they are only recommendations, the political penalty for saying to this group of eminent people who think we have a safety problem, no, we are not going to do that, is quite high. So, for the most part, we accept the recommendation and then try to figure out what we got ourselves into. That may not be the best way to proceed, either.

REGULATORY OVERSIGHT BURDEN

Mr. FAZIO. Would you broaden responsibility of the board or would you eliminate this sort of oversight entity? What new model would you recommend given your personal views on this, and what could we in general do to streamline the oversight process, maybe make some improvements in the regulatory burden that DOE deals with in this regard?

Dr. O'TOOLE. Well, I think we should learn from the past 20 years of regulation. I think we have demonstrated pretty clearly that regulating pollutant-by-pollutant or media-by-media or discipline-by-discipline, whether you are talking about water and then air or you are talking about Superfund and then RCRA or you are talking about nuclear safety and industrial hygiene, doesn't make sense. You really need a multidisciplinary approach to these kinds of problems, so that would be my first comment.

Mr. FAZIO. Would that imply, then, that you think this board should have a broader mandate to be multidisciplinary in its approach to safety?

Dr. O'TOOLE. I would prefer to see one regulator approaching health and safety from a coherent multidisciplinary perspective and not three or four regulators, but perhaps not this board in its current format.

Mr. FAZIO. Do you have, without making policy for the department here, and I don't want to push you into that, do you have some other model in mind?

Dr. O'TOOLE. Well, it is tempting, but I think it would probably be prudent to wait until the External Advisory Committee has some time to, you know, consider. This is a great committee that does encompass the kind of multidisciplinary talent I am speaking of. I really am interested in hearing their views and seeing what they can come up with.

LABORATORY OVERSIGHT

Mr. FAZIO. Okay. I will leave it at that. I just want to touch on the other issue related to national labs. Obviously, they are now in a more competitive mode trying to see whether they have a future, whether they will survive. There is an interest in outside work.

We have the Galvin report which has been presented to this committee by the Chairman himself. He talks about corporatization of the multipurpose national labs as a solution to what he, I think, clearly called micromanagement from Congress and perhaps even DOE.

I am wondering what you think of that basic theory, should the labs do their job with less interference or is there a downside to that? I would be interested in your thoughts about how they may be able to improve their culture, operate more entrepreneurially and hopefully more effectively.

Dr. O'TOOLE. Labs are tough. You know, labs are special places. Scientists are weird, and you want them weird.

Mr. RIGGS. Did you say weird or nerd?

Dr. O'TOOLE. Weird and nerdy, and that is good.

Mr. FAZIO. We will let you correct the record. We can't do that anymore so you are on the record.

Dr. O'TOOLE. Science is risky, that is what it is about. It is about kind of flying into the unknown, trying to figure out what is going on there. I read a 1948 report by an independent panel investigating health and safety at the Atomic Energy Commission.

They were saying, you know, health and safety has gone downhill in the last four years. Those contractors aren't doing what they are supposed to, but the universities and the labs are even worse, and some directors of laboratories act as though anything a scientist wants to do is okay as long as he only kills himself, and, you know, that is part of a laboratory ethic. It isn't just the national labs, it is every lab I have ever worked in or done a walk through on for health and safety.

So one has to strike a balance between maintaining intellectual freedom and the opportunity to experiment with prudence and responsible health and safety practices, and I think that can be done. I think it actually has been done in the private sector. But it is a culture change for these labs which, like the weapons complex, have been insulated from the real world for some time.

I agree with them, however, that oversight has been unduly intrusive and not value added in the past. I would add that what the lab directors are talking about as oversight includes oversight of procurement and business practices, not just environment, safety and health, and had they done their own analytical homework, which I do fault them for, and surveyed what oversight they have gotten in the past three years, they would have seen that less than 10 percent of the oversight they are complaining about came from DOE headquarters.

About 40 percent of it was from the contractors themselves, and the rest of it was from the DOE field organizations, and, again, that type of oversight, I think, has been inappropriate. It has been repeated and repeated and repeated instead of pyramided and structured to get better and better handles on what is going on out there.

Mr. FAZIO. You have given me, I think, a very good response in a general sense. I have some specific questions I will place in the record and give you a chance to be even more explicit in the approach you have taken, but I appreciate the orientation you have. It sounds to me like we are working toward a resolution of some of the dispute that the lab directors and others probably are stimulating out there.

Dr. O'TOOLE. Yes, I think so.

Mr. FAZIO. It seems to me you have understood their concerns and you are dealing with them, and I appreciate that, but we will let you detail that for the record.

Thank you, Mr. Chairman.

Mr. RIGGS [presiding]. Thank you, Mr. Fazio. The Chair recognizes the gentleman from New Jersey, Mr. Frelinghuysen.

COORDINATION WITH OTHER FEDERAL AGENCIES

Mr. FRELINGHUYSEN. Good morning. How are you? I just had some general questions. Both you and the Secretary yesterday in her testimony, you don't make much reference to your work with other Federal agencies.

I understand from your biography you are the key person that relates with other Federal agencies in terms of environmental, safety and health regulations. Could you comment a little bit how you relate to other agencies? One of the things you hear in this committee is that there is sort of overkill. Everybody gets into the act here, DOE, EPA, OSHA, NRC. This is somewhat akin to Mr. Fazio's comments, but I want to just take it a step higher.

I just wonder how you interrelate with your counterparts in these other agencies because a lot of taxpayers' dollars are being spent, certainly your job here is to protect workers and communities, but I just wonder whether there is a—how you relate to other agencies.

Dr. O'TOOLE. Well, you are quite right. We can't afford to waste resources in these important areas. We are partnering, for example, with the Centers for Disease Control, and we have moved much of the epidemiologic research and the worker health and safety research out of DOE and into the hands of the people at the National Institute of Public Safety and Health and the Center for Environmental Health.

Those institutions are much better equipped and prepared to do this kind of scientific investigation and also don't have the credibility problems that DOE has in this area, so that is one instance, the partnering. We have been talking with the Occupational Safety and Health Administration, which for the most part has no authority or presence at DOE. It does regulate, for example, the petroleum reserve, but it doesn't have anything to do with the nuclear weapons complex.

In talking about how we might partner with them to, for example, experiment with new, more efficient ways of regulating workplaces, since we are self-regulating at the moment we can try anything, and we have a couple of ideas under way and are about to sign a memorandum of understanding with OSHA to do just that. We are, for example, at Rocky Flats, beginning to use OSHA's reporting system for complaints from workers.

We are changing out the contractor at Rocky Flats, and there were concerns among the workers that the old contractor wasn't responding to their safety concerns with alacrity. On the other hand, DOE was wondering if maybe the workers were complaining about safety when they were really worried about jobs.

Now, we have an independent mediator to track worker complaints and see how fast it takes to get them addressed, so we are partnering with OSHA. EPA does have regulatory authority over DOE, and we have been working with them in the area of radiation standards, for example, to pool our resources and figure out what we have to do next in radiation policy, but for the most part my office is engaged in, you know, liaison with EPA to understand what they are doing and what they are about, but DOE and EPA have the typical relationship of an entity and its external regulator.

COST ANALYSIS

Mr. FRELINGHUYSEN. Does the pooling of resources, besides, obviously, the legal responsibility of each of these entities, does anyone ever raise the issue of the cost of what everybody is doing?

Dr. O'TOOLE. Oh, yes.

Mr. FRELINGHUYSEN. I know you have invoked in your statement here and I think it is admirable that your office has sought to model itself after private corporations with the best records of protecting environment, safety and health, but in reality one of the reasons that government models itself after the private sector also is to save money, and I do get a feeling around here that since it is governmental money, people aren't as concerned about holding on to those resources, that there is a certain feeling that the government money is more expendable because there is plenty of it, we can always make some more.

Dr. O'TOOLE. It depends on how many problems you have to address. At DOE our problems outweigh even the government money so we are very interested in frugality. I am on record and Tom Grumbly at this point is on record as endorsing cost analyses of the various fixes we are proposing for the environmental management program, for instance.

Mr. FRELINGHUYSEN. I think it is important that everybody certainly—I don't know you, but certainly everybody has a very high regard for you, but I think it is important as you do your mission that periodically the issue of saving money and working with other agencies be raised because I think it is important. I think people generally have a feeling out there that there is a heavy hand of the government, a lot of things that are done are highly duplicative, and it would be nice periodically to get some reassurance that agencies are communicating with one another.

As important as your mission is, it would be nice that that communication exists and you are basically telling me that communication does exist in most instances?

Dr. O'TOOLE. Yes.

Mr. FRELINGHUYSEN. All right. Well, thank you very much, doctor, and thank you, Mr. Chairman.

Mr. RIGGS. Thank you, Mr. Frelinghuysen.

The Chair recognizes the gentleman from Oregon, Mr. Bunn.

MEDICAL SURVEILLANCE FOR EMPLOYEES

Mr. BUNN. Thank you, Mr. Chairman.

Dr. O'Toole, Section 3162 of the 1993 defense authorization act provides for medical surveillance for former, current, and future DOE employees exposed to significant levels of radiation. What is the status of the implementation and does the proposal for the 1996 year budget keep us on track?

Dr. O'TOOLE. We have broken that project into two parts—current workers and former workers because they are administratively and scientifically really very different projects. In terms of current workers, we are expanding our beryllium surveillance significantly this year. That is part of the budget. We are also piloting three, perhaps as many as five approaches to exposure assessment, which is the key ingredient of medical surveillance at Hanford as well as at Rocky Flats, Fernald, and possibly Oak Ridge and Pantex.

We have been doing beryllium surveillance among former workers. That will continue and expand. We are also trying to figure out what exactly makes sense for former workers. The science of medical monitoring for people who have been exposed to chemicals and radiation in the past is not what one would wish. We do not have very many tools for testing people to see if they have been exposed in the past or if those exposures have done harm, and when we do have tests, we are not quite sure what to do next, so it is very important that we formulate a program that benefits people and that is affordable. We are meeting actually later this month with a number of the most interested parties, union representatives, representatives from the National Institute of Occupational Safety and Health, and scientists and doctors in this field to see if we can come up with a coherent consensus plan for medical surveillance for former workers now that we will try and pilot and begin in 1996, but the big budgetary request for that would come in 1997.

My 1996 budget basically expands current programs for former workers, particularly in beryllium, but does not include monies for a brand new program for former workers.

Mr. BUNN. Okay. Thank you.

RADIOACTIVE WASTE DISPOSAL

Mr. RIGGS. Thank you, Mr. Bunn.

Dr. O'Toole, I want to go back just for a moment and revisit the subject because we are not going to put it to rest today.

Dr. O'TOOLE. Alas.

Mr. RIGGS. But, again, I think it has obviously profound implications for the future mission of the Department, specifically the mission and role of your office, and obviously, there are tremendous budget implications as well.

I want to get a better understanding. You said or you inferred that Mr. Bowman was promoting an alternative method of plutonium disposal, but is that at odds with the notion of this long-term burial? I think what he says or is suggesting is that we might, as you mentioned earlier, look at an alternative plan in which particle accelerators would transmute radioactive waste such as plutonium into more benign elements before they were buried.

Does that make sense fiscally or from a safety standpoint because, again, as I understand his theory, the concern is that these plutonium wastes are going to be buried in canisters which will ultimately dissolve, yet the waste will still be active? I am assuming that the overall complex would be well sealed. Again, he is suggesting that a hazard will exist well into the future, hundreds of thousands of years that there is a possibility of, and this is hard for the layperson to grasp, but there is a possibility of groundwater interacting with the plutonium waste and creating an explosion hazard, so going back to my question, would it make sense to study the idea of the particle dissolving through this acceleration process before the waste is buried?

Dr. O'TOOLE. Oh, it absolutely makes sense to study it, which is why the DOE commissioned the National Academy to do that for three years as well as look at other options. There is no question about that, and as I said, we are still looking at Yucca Mountain and the scenario that is planned for that.

If I could just recapitulate what I think, and I am not an expert in plutonium disposition technologies, please understand, but I think the safety issues that Dr. Bowman raises are as follows. We have this defense waste which includes plutonium that we are going to convert from liquids, which leak and are yucky and can go critical, into glass logs. Then we are going to put the glass logs in canisters and bury them in the mountain. You are quite right. I think Dr. Bowman is concerned that if a series of at least three things happen, then you could have a criticality in the mountain.

Other scientists think the likelihood of any one of those three things, let alone all together occurring, is very, very low, "vanishingly low" is the phrase that I read in the one paper that was looking at this. Again, these are newspapers, not scientific journals. But if that were to occur, that would be a very horrendous accident.

The question becomes what is the likelihood of that occurring and what are the benefits versus the risks of other ways of disposing of high level waste? Accelerators are not immediately available. There is going to have to be a considerable development time and investment in this technology before we know exactly what that is all about and what it can do, and that is really the case for any alternative. So it is a matter of laying your bets, given the uncertainties that are always going to exist in one form or another, and different people are going to have different opinions of the uncertainties, and figuring out what the best course forward is.

I think we are going to hear a lot more about this thesis in the coming weeks. I know that the Department is thinking of asking the National Academy to put together an expedited review panel to look at Dr. Bowman's thesis. The National Academy usually takes a year or two to do such things so whether or not it would be useful and timely, I think, remains to be seen. But if they could expedite it, that might, you know, help foment a national debate, which I think has got to continue.

TRANSPORTATION OF RADIOACTIVE WASTE

Mr. RIGGS. Okay. Let me suggest that I think the public is well-served by the vetting, if you will, of these concerns. Let me also, before I recognize Mr. Knollenberg, just ask you about one other question, and that is the transportation of low and high level radioactive waste, which has become a concern in my Congressional District with the decommissioning of the nuclear power plant at Humboldt Bay in Humboldt County, California.

What is the process involved there in terms of selecting the best route from various alternatives in terms of ultimately determining the safest route for the transportation of these wastes?

Dr. O'TOOLE. I am not personally knowledgeable in those issues. I would be happy to reply to the record. That does not come under my purview. That would be in Mr. Dreyfuss' program, but I would be happy to find out for you.

Mr. RIGGS. What is the name of that program?

Dr. O'TOOLE. The Office of Civilian Radioactive Waste.

Mr. RIGGS. So it would be completely separate and arm's length from your particular office?

Dr. O'TOOLE. We do do packaging and transportation issues, but we are concerned mostly with how you have to appropriately package plutonium to move it from one place at Rocky Flats to another or across the country, i.e., those special defense materials that are not covered by the Nuclear Regulatory Commission regulations.

Mr. RIGGS. Thank you. I appreciate your referring me to him. We will make contact with him regarding the broader policy issue as well as our particular concerns in the First Congressional District of California.

Mr. Knollenberg, good morning, sir.

BUDGET REQUEST

Mr. KNOLLENBERG. Mr. Chairman, thank you.

Dr. O'Toole, thank you. I have been late attending another meeting here. I apologize for that. I have a couple of, I think, relatively simple questions. I take it that you may have responded to part of these and maybe you haven't, but you judge and if you are repeating or going over plowed ground, you can tell me.

I noticed in your statement you referred to the fact that the 1996 fiscal year or total budget is slightly lower than the request for the previous year, and that is true, and lower than the 1993 appropriation, but I know you omitted 1994, which I have observed is higher. I beg your pardon is lower, $179 million, so we seem to have a pattern here of 1993 was $224 million, am I right?

Dr. O'TOOLE. I don't have 1993 in front of me.

Mr. KNOLLENBERG. Close. 1994 was $179, 1995 was $193, now we are back to $222 million.

Dr. O'TOOLE. Okay. This is another one of those interesting vagaries of the Federal budget process.

Mr. KNOLLENBERG. It may be a numbers thing, but if you would explain please.

Dr. O'TOOLE. My budget numbers for 1993, 1994, 1995 and 1996 read $228, $216, $200, and $222 million.

Mr. KNOLLENBERG. Why do they read that way?

Dr. O'TOOLE. Because it is new money plus carryovers from previous years.

Mr. KNOLLENBERG. Unspent monies?

Dr. O'TOOLE. Correct.

Mr. KNOLLENBERG. Maybe you have covered this already in your testimony.

Dr. O'TOOLE. No, I haven't.

Mr. KNOLLENBERG. What were the unspent monies for 1993 that was carried over?

Dr. O'TOOLE. Is that on here, Geoff? We can certainly get you that.

Mr. KNOLLENBERG. Maybe you are not asking for more money, but it appears as though you are, and if you are talking you are locking into some carryovers, maybe that explains it.

Dr. O'TOOLE. Well, if you are talking about—I think the easiest way for me to understand this is you are talking about the monies spent in each fiscal year, actually spent. I am asking for less money this year than I spent in 1994. I will spend, if you give me what

I am asking for, all right, I will spend less money than I spent in those years. The carryovers do get confusing.

STAFFING LEVELS

Mr. KNOLLENBERG. They do, and for some of us who have maybe a simple approach to bookkeeping, it doesn't get told in these numbers, and thus the inquiry. This is a question, too, that you may not have the answer to, but in terms of the personnel side of your agency, has that been static in numbers?

Dr. O'TOOLE. No.

Mr. KNOLLENBERG. It has grown?

Dr. O'TOOLE. It has grown.

Mr. KNOLLENBERG. Give me a why.

Dr. O'TOOLE. Sure. It has gone from approximately 400 to about 485, or it will by some time midyear is what I am expecting. I have a staffing plan in place. The reason for that is our need for a new skill mix. We had a serious deficit of people with training in industrial hygiene and construction safety and occupational medicine, for example, and the complexion of our staff as of 18 months ago reflected the nuclear emphasis of weapons production and the emphasis on safety versus health, for example.

I expect that after going up and acquiring these new skills the size of our office will then over a period of years go down. It may go down more precipitously, depending upon what the Secretary's realignment assessment says we ought to look like, but the rules of the civil service make it difficult to simply adroitly change your skill mix overnight while keeping your numbers the same, unless you exercise a reduction in force, which also very rarely gets you the kind of skill mix that you are after.

What you do in that case is lose your oldest and your wisest people, so it has gone up and I will expect that it will over time, how much time, again, depending on the realignment, come down.

PERSONNEL COSTS

Mr. KNOLLENBERG. As a percentage of your total budget, have your personnel costs risen or been flat?

Dr. O'TOOLE. No, the personnel costs have gone up commensurate with these additional 80 or so people. We have also worked with some success to decrease our dependency on contractors. For example, we are now doing our first comprehensive new look at oversight assessment at Rocky Flats, and the original proposal was that 70 percent of the team would be outside contractors. We said, no. We are now down to 50 percent of the team will be outside contractors.

The next time we do it, it will be lower and lower and lower, and we are working to train our own people and wean ourselves of dependence on outside contractors, but, again, that is something that you can't do overnight because of the specialized skills that some of these assessments demand, but it is one of our goals and it is written into our staffing plans.

Mr. KNOLLENBERG. So this factor, this phrase that you use, skill mix, I have heard that before, and the effort is being made to introduce this component into your staffing situation so that you will have more capacity to do what was previously done by outside contractors?

Dr. O'TOOLE. Exactly, inhouse, or not done at all.

Mr. KNOLLENBERG. Not done at all, but it requires an initial influx of personnel?

Dr. O'TOOLE. That is right.

Mr. KNOLLENBERG. I think that concludes my questions. Thank you, Dr. O'Toole.

Mr. Chairman, back to you.

Mr. RIGGS. Thank you, Mr. Knollenberg. I think that concludes our hearing. Dr. O'Toole, I want to thank you and your staff for appearing before the subcommittee this morning.

Subcommittee will stand in recess and will reconvene at 2:00 this afternoon.

Dr. O'TOOLE. Thank you, sir.

[The prepared statement of Dr. O'Toole and the questions and answers for the record follow:]

GENERAL

Chairman Myers. It is clear that the Department views the health and safety of the workers and the public as a top priority. The Department has spent large sums of money for health and safety programs; in fact, 14 percent of the Department's fiscal year 1996 budget ($2.6 billion) is targeted for health and safety. What improvements in the Department's health and safety performance have resulted from the increased attention and dollars?

Dr. O'Toole. We have begun to see some of our efforts focused on accident and illness prevention at Department of Energy facilities pay off. Over the last four years, the Department of Energy has recorded a steady decline in recordable accident rates. Our overall accident rate has decreased by eight percent and our rate of serious accidents has declined 30 percent from 58.7 in 1991 to 41.1 in 1994.

However, much remains to be done. The end of the Cold War and cessation of weapons production has resulted in a dramatic change in mission direction that today reveals a vast legacy of hazards that the Department of Energy must confront and manage. We must institute effective programs to prevent contamination of the environment, and to forestall injuries and illnesses among workers engaged in environmental cleanup and decontamination and decommissioning of old facilities

For example, properly implemented hazard identification as part of a worker medical surveillance program can detect or diagnose symptoms early and allow us to intervene to prevent disease, potentially saving taxpayers millions of dollars in avoided lawsuits and health care costs; similarly, focused work planning can avoid lost production and worker compensation claims. A 1993 fatal accident at the Department of Energy's Hanford site, for example, could have been avoided if a worker opening a valve on an active steam line in an underground concrete pit had planned for the possibility of a steam release in the enclosure. In addition to the individual's death, significant and costly delays in operations were caused by the accident. These and many other examples demonstrate how an investment in worker safety and health prevention now can provide returns to the taxpayer time and again

Chairman Myers. Please describe the budget planning process for environment, health, and safety

Dr. O'Toole. The Environment, Safety and Health Management Planning Process provides a structured management decision-making process through which the scope and cost of environment, safety and health activities are critically discussed among managers competing for the same resource pool and systematically reviewed by management at the contractor, operations office, and headquarters program office. It establishes specific expectations or commitments for each funded environment, safety and health activity, increased accountability for environment, safety and health performance, and a consistent and traceable basis for focusing limited resources on the most beneficial risk-reduction activities.

Chairman Myers. Does the Department use a risk-based prioritization mechanism to evaluate the specific activities for resource allocation purposes?

Dr. O'Toole. Yes, the Departmental Environment, Safety and Health Management Planning Process utilizes a risk-based prioritization approach to review line program environment, safety and health budgets and ensure that all risk-significant environment, safety and health issues are adequately addressed in the Department's budget.

Chairman Myers. Is this system used by all programs in the Department?

Dr. O'Toole. Yes, all of the Department's line programs utilize the Environment, Safety and Health Management Planning Process.

Chairman Myers. Does the Department evaluate the budget impacts of proposed DOE orders and directives before the contractors are directed to implement the new requirements?

Dr. O'Toole. All proposed Department of Energy orders, including environment, safety and health orders, are submitted to Headquarters and Field elements for review before promulgation. All comments received, including those addressing budget impacts, are evaluated and appropriate changes are made.

Chairman Myers. If so, does your office coordinate this effort?

Dr. O'Toole. Yes, my office is coordinating the Departmental Standards Committee for environment, safety and health standards, and the review of environment, safety and health orders.

Chairman Myers. Are there any examples where the directives were modified as a result of this analysis?

Dr. O'Toole. Yes. The Radiation Protection order, and accompanying RadCon Manual, was revised based upon comments received from Headquarters and Field organizations. For example, we dramatically revised the posting requirements for controlled areas and provided a ten fold increase in the levels of tritium allowed for the release of materials.

Chairman Myers. Please provide for the record a summary by program for health and safety funding for fiscal years 1994, 1995 and 1996.

Dr. O'Toole. The information requested is provided for the record.

DEPARTMENT OF ENERGY
HEALTH AND SAFETY FUNDING
(\$ in thousands)

	FY1994	FY1995	FY1996
Energy Research	214,450	227,180	238,878
Defense Programs	434,467	427,488	449,923
Environmental Management	1,267,519	1,358,402	1,364,013
Nuclear Energy	59,579	63,794	63,061
Energy Efficiency	1,601	1,601	1,864
Other	44,499	52,110	63,862
Total DOE	$2,022,115	$2,130,575	$2,181,601

Note The planning level for FY 1993 was $2 2B, although $1.7B was actually spent for safety and health activities Planning for FY 1994 was $2 4B, our best estimate of actual spending is $2 02B This trend indicates the actual funding applied to safety and health is about 20-25% less than anticipated Therefore, applying 20% across FY 1995 and FY 1996, the funded levels for safety and health will likely decrease for the Department of Energy

Chairman Myers. Your statement expresses concern with the Department's former approach to oversight which focused on long lists of deficiencies, but little sense of priorities However, Departmental facilities are left with the legacy of these findings and the requirement that they all be fixed What are you doing to restructure and prioritize these previous findings?

Dr O'Toole All Department of Energy facilities utilize the Environment, Safety and Health Management Planning Process to prioritize activities developed in response to oversight review findings, including both an assessment of the relative risk associated with the issue and the risk-reduction provided by the proposed activity. This process is being used to address previous and present oversight review findings.

Chairman Myers. How does the Department's record in recordable accident rates compare to industry averages?

Dr. O'Toole. Department of Energy recordable accident rates compare favorably with private industry. In calendar year 1993, for example, the Department of Energy averaged 3.7 recordable injury and illness accidents per 200,000 hours of work as compared to 8.5 recordable accidents for private industry.

Chairman Myers. Can you quantify how safety performance such as lost work days and radiation exposure have improved at DOE facilities?

Dr. O'Toole. The Department of Energy measures injuries and illnesses in accordance with Bureau of Labor Statistics criteria, property damage accidents, and radiation exposures. Total recordable case rates for calendar years 1990 through 1994 show the Department of Energy's average rate to be 43% that of private industry. Rates are based on Bureau of Labor Statistics data using Bureau of Labor Statistics reporting criteria. Other statistics on severity of accidents and radiation exposure data show a similar favorable comparison between the Department of Energy and industry.

Chairman Myers. You are recommending rewriting DOE Orders to simplify the oversight system, but an equal problem is the cascading of orders as they are interpreted by the field office and the contractor. How will you address that problem?

Dr. O'Toole. We believe that the cascading problem you describe has been caused by the redundancies, conflicts, and unnecessary or prescriptive requirements in existing Orders. My office is leading a Department-wide effort to review requirements in existing environment, safety and health Orders; the goal of this effort is to have Order requirements that are less prescriptive and more performance-based to allow flexibility in implementation for diverse activities. We hope to issue the revised Orders this summer.

Chairman Myers. The Department investigated an electrical accident in which a contractor employee was injured, and concluded that the employee used poor individual judgement by choosing to work on an energized electrical panel and neglecting to use protective equipment. Could this conclusion have been reached without spending $393,000 to investigate and prepare a report?

Dr. O'Toole. The purpose of accident investigations is to prevent recurrence and not to fix blame. While the report revealed "poor individual judgment, " it found that the major root cause of the accident was ineffective management. The accident investigation has resulted in implementation of a rigorous electrical safety program for managers, supervisors and workers at the plant. This involves understanding and acceptance of safety requirements, feedback mechanisms for validation, use of accountability principals and establishing effective supervisory control systems. These same management improvements can be applied to many other activities at the plant as well as other Department of Energy sites.

OVERSIGHT

Chairman Myers. What has your office done to address the concern that has been expressed about the excessive oversight of the DOE facilities from internal and external oversight groups?

Dr. O'Toole. We are taking several steps to address this concern. First, effective in December 1994, the Office of Environment, Safety and Health independent oversight structure was formally revised and streamlined. This restructuring will solve many of the identified problems by unifying all the environment, safety, health, and security oversight groups under one umbrella. The net result will be a significant decrease in the number of oversight reviews conducted by my office, while increasing their quality and usefulness to the field. Also, we believe the newly-created independent oversight organization will improve the Department of Energy's performance in environment, safety, health, and safeguards and security, and establish credibility with external agencies such as the Defense Board, the Occupational Safety and Health Administration, the Environmental Protection Agency, and state agencies.

Second, we are working with line management to eliminate redundant functions and groups contained within the program offices.

Chairman Myers. Could you provide for the record a list of all the ES&H reviews conducted at the DOE facilities for fiscal year 1993 and fiscal year 1994, and planned for fiscal year 1995?

Dr. O'Toole. The information requested is provided for the record.

The following summarizes the Office of Environment, Safety and Health assessment activities at the National Laboratories in 1994:

- Argonne National Laboratory/Chicago Operations Office
  - 12/94 - Security Evaluations Comprehensive Inspection
- Ames Laboratory/Iowa State University
  - 09/94 - Routine Environmental Audit
- Brookhaven National Laboratory/Chicago Operations Office
  - 06/94 - Chemical Safety Vulnerability Field Verification
  - - Oversight Assessment of Readiness Review High Flux Beam Reactor
  - 12/94 - Security Evaluations Comprehensive Inspection
- Idaho National Engineering Laboratory/Idaho Operations Office
  - 05/94 - Review of Alleged Asbestos Exposure
  - 06/94 - Assessment of Denitrator/Product Vault at Idaho Chemical Processing Plant
  - - Oversight Assessment of Readiness Review of Fuel Cycle Facility
  - - Oversight Assessments of Readiness Reviews of Radioactive Waste Management Complex, Building 603, Test Reactor Area Hot Cells, Advance Test Reactor and Denitrator
  - - Special Study of Facility Aging and System Integrity
- Lawrence Berkeley Laboratory/Oakland Operations Office
  - 11/94 - Routine Environmental Audit
- Lawrence Livermore National Laboratory/Oakland Operations Office
  - 04/94 - Chemical Safety Vulnerability Field Verification
  - - Special Study of Facility Aging and System Integrity
  - 06/94 - Routine Environmental Audit
- Los Alamos National Laboratory/Albuquerque Operations Office
  - 05/94 - Chemical Safety Vulnerability Field Verification
  - - Oversight Assessment of Readiness Review of TA-55 Cassini Program
  - - Special Study of Facility Aging and System Integrity
  - 09/94 - Security Evaluations Comprehensive Inspection Office
- Oak Ridge National Laboratory/Oak Ridge Operations Office
  - 04/94 - Chemical Safety Vulnerability Field Verification
  - 09/94 - Special Study of Facility Aging and System Integrity
- Sandia National Laboratory-New Mexico/Albuquerque Operations Office
  - 12/94 - Routine Environmental Audit
- Sandia National Laboratory-California/Oakland Operations Office

12/94 - Routine Environmental Audit
Sanford Linear Accelerator Center/Oakland Operations Office
01/94 - Environmental Management Assessment
Continuous Electron Beam Accelerator Facility
01/94 - Review of Accelerator Readiness Review

The following summarizes the comprehensive appraisals of the new Environment, Safety and Health Evaluations Office planned activities for 1995. 1995 short notice reviews and all 1996 activities are still in the planning stages:

03/95 Rocky Flats Plant/Rocky Flats Office
06/95 Idaho National Engineering Laboratory/Idaho Operations Office
08/95 Oak Ridge National Laboratory/Oak Ridge Operations Office
11/95 Savannah River Plant/Savannah River Operations Office

The following summarizes the Security Evaluations activities for 1994 and planned activities for 1995. 1995 short notice reviews and all 1996 activities are still in the planning stages:

10/93 Special Study of Safeguards and Security Technology Assessment
12/93 Lawrence Livermore National Laboratory/Oakland Operations Office
01/94 Rocky Flats Plant/Rocky Flats Office
03/94 Oak Ridge Operations Office
05/94 Richland Operations Office
06/94 Santa Barbara/Nevada Operations Office
08/94 Special Study of the Sale of Reprocessing Equipment at the Idaho Operations Office
10/94 Strategic Petroleum Reserve Office
12/94 Special Study of the Release of Nuclear-Related Property and Associated Documentation by the Department of Energy
01/95 Special Study of Increasing Fissile Inventory Assurance Within the U.S. Department of Energy
03/95 Pantex Plant/Albuquerque Operations Office
06/95 K-25/Oak Ridge Operations Office
08/95 Special Study of The Redundancy of Oversight Within the Department of Energy including both the Line and Field Perspectives
08/95 Sandia National Laboratory/Albuquerque Operations Office
08/95 Special Study of the Department of Energy's Unclassified and Classified Computer Security Programs and Other Systems Containing Sensitive Data and their Interfacing with Internet and Other Networks

Chairman Myers. Do you expect to have the same number of reviews in fiscal year 1996?

Dr. O'Toole. No, the Office of Environment, Safety and Health's fiscal year 1996 budget request anticipates 4 comprehensive, multi-functional, programmatic reviews; 4 focussed, short-notice reviews of a specific environment, safety or health area; 2 special studies of significant environment, safety and health issues across the Department of Energy complex; and 14 safeguards and security inspections.

This signifies a clear departure from prior oversight exercises. In the old Office of Environment, Safety and Health organization, several different Deputy Assistant Secretaries conducted oversight assessments that were split among disciplinary lines and often duplicative. Evaluations of nuclear safety, occupational safety, occupational medicine, safeguards and security, etc. were carried out sequentially, resulting in unwarranted burdens on field sites and a fragmented view of environment, safety and health performance. In addition, the former approach to oversight focused on identifying long lists of instances of noncompliance with requirements and good practices. This approach left managers with overwhelming catalogues of deficiencies, but little sense of priorities.

Chairman Myers. Your budget has identified a goal for your organization "to continue an effective system of policies, requirements, guidance and technical standards that significantly will increase protection of the environment and enhances public and worker safety and health." What metrics will be used to evaluate whether this goal is achieved in fiscal year 1996?

Dr. O'Toole. The success indicators for this goal include: the field, contractors, and outside organizations increasingly adopt Office of Environment, Safety and Health standards; environment, safety and health performance trends improve, e.g., decreased lost work days due to occupational illness or injury, decreased number of personnel contaminations with radionuclides; and a decreasing trend in the number of serious accidents where policy is a root cause of the problem.

Chairman Myers. Please clarify the ES&H oversight responsibilities for your organization, the program offices and the field offices.

Dr. O'Toole. The Office of Environment, Safety and Health is the only source of information about the conduct and adequacy of environment, safety and health that is independent of line programs. Under the Atomic Energy Act, the Department of Energy is self-regulating in the areas of worker protection and nuclear safety. The purpose of the Office of Environment, Safety and Health oversight program is to provide the Secretary and Department of Energy managers with an important tool -- an independent and unbiased view of how well they are doing in managing for environment, safety and health, and safeguards and security.

The responsibility for implementing environment, safety and health programs rests with headquarters and field office managers of line programs such as Environmental Management and Defense Programs.

Chairman Myers. Why is it necessary for each program organization at headquarters to have its own ES&H staff?

Dr. O'Toole. We do not believe it is necessary for each program organization at headquarters to duplicate environment, safety and health responsibilities of the field elements. The current Strategic Alignment is analyzing this issue on a Department-wide basis.

As the Defense Nuclear Facilities Safety Board -- and many other critics of the Department of Energy -- have noted, the Department's programs lack sufficient managerial expertise in environment, safety and health. Departmental programs are executing technical training programs and have made use of "excepted service" hiring authority to help remedy this situation. In the near-term however, the Office of Environment, Safety and Health constitutes the Department's "corporate resource," i.e., the major source of expertise in disciplines such as environmental protection, nuclear safety engineering, public health, industrial hygiene, radiation protection, construction safety, risk management, epidemiology, and occupational medicine. We have put in place an organization designed to leverage the talent in the Office of Environment, Safety and Health to meet our goal of "making it safer" for those who work within or live nearby Department of Energy operations.

The Office of Environment, Safety and Health has embarked on this new direction in part because the best in the private sector -- companies like AT&T, Mobil, Dow and Monsanto -- have demonstrated such an approach to be both successful and effective. We are determined to pursue this course because the need for environment, safety and health improvements, particularly at the Nuclear Weapons Complex, is urgent.

Chairman Myers. Is it anticipated that your office will be the corporate ES&H resource with no need for multiple ES&H offices throughout the Department?

Dr. O'Toole. The Office of Environment, Safety and Health constitutes the Department's "corporate resource" for expertise in environment, safety and health disciplines, such as environmental protection, nuclear safety engineering, public health, industrial hygiene, radiation protection, construction safety, risk management, epidemiology, and occupational medicine. We have put in place an organization designed to leverage the talent in the Office of Environment, Safety and Health to meet our goal of making it safer for those who work within or live nearby Department of Energy operations.

At the same time, we are mindful that responsibility for implementing health and safety programs rests with managers of line programs such as Environmental Management and Defense Programs. Recognizing that the oversight activities of the line have been excessive and uncoordinated, the Associate Deputy Secretary for Field Management is leading a Department-wide review of how we can better design, coordinate, and conduct line oversight activities.

Chairman Myers. Clarify the relationship of the Office of Nuclear Safety with the Defense Nuclear Facilities Safety Board (DNFSB).

Dr. O'Toole. The Defense Nuclear Facilities Safety Board is an external executive agency that was statutorily created with explicit powers to review, monitor and assess the safety of Department of Energy defense nuclear facilities and operations. The Office of Nuclear and Facility Safety is a part of the Office of Environment, Safety and Health within the Department of Energy and is responsible for providing policy and technical assistance to Department of Energy facilities in the areas of nuclear and facility safety. This is carried out through an integrated program involving analysis of facility operations, assistance to line managers for their implementation of major nuclear safety assurance programs, and the development of policies and standards.

Chairman Myers. How many recommendations have been issued by the DNFSB to the Department?

Dr. O'Toole. The Defense Nuclear Facilities Safety Board has issued 31 sets of recommendations totalling 131 specific recommendations since 1990.

Chairman Myers. Has the Department initiated action to implement all recommendations received to date?

Dr. O'Toole. The Department has issued Implementation Plans for 28 of the 31 recommendations. The remaining three Implementation Plans are scheduled to be issued by May 1995.

Chairman Myers. Has the budget impact of implementation of the DNFSB recommendations been quantified?

Dr. O'Toole. The Department has not singled out for quantification the budget impact of implementing the Defense Nuclear Facilities Safety Board recommendations. The Implementation Plans in many cases redirect, both in schedule and priority, the application of resources already applied to ongoing projects. In other cases, the Defense Nuclear Facilities Safety Board recommendations cause the Department to reevaluate its commitments to ongoing efforts to find ways to become more efficient and effective in accomplishing its mission while ensuring the health and safety of its workers and the public.

Chairman Myers. We understand that the Department has established an Aging Management and Life Extension Program "to promote excellence in aging management of DOE facilities through reviews, assessments and sharing lessons learned." How is this activity coordinated with other Departmental activities reviewing aging facilities such as the EM Facilities Stabilization Program and the Capital Assets Management Program?

Dr. O'Toole. The Aging Management and Life Extension Program was initiated in 1993 in response to concerns about the safety implications of deteriorating facilities, particularly those built in the 1940s, 1950s, and 1960s. Our responsibilities include standardizing concepts, establishing criteria for evaluating aging management, and promoting excellence in aging management through reviews and information sharing.

This program is coordinated with other Department of Energy programs, including the Office of Environmental Management. For example, we have been participating with the Office of Environmental Management to develop an aging management and structural integrity program for high level waste tanks.

Chairman Myers. What on-site assessments are scheduled for fiscal year 1995 and fiscal year 1996?

Dr. O'Toole. We will evaluate aging management programs as a part of the comprehensive Office of Environment, Safety and Health Oversight Programs. Office of Environment, Safety and Health oversight reviews anticipated for FY 1995 include the Rocky Flats Plant/Rocky Flats Office, Idaho National Engineering Laboratory/Idaho Operations Office, Oak Ridge National Laboratory/Oak Ridge Operations Office, and the Savannah River Plant/Savannah River Operations Office.

Chairman Myers. How much is included in the fiscal year 1996 budget for this program?

Dr. O'Toole. We have not budgeted separately for this program

Chairman Myers We understand that the Department has established an External Regulations Advisory Committee. What is the charter and member composition of this Committee? When is it expected that the Committee will issue any recommendations?

Dr. O'Toole. The Secretary of Energy established the Advisory Committee on External Regulation of Department of Energy Nuclear Safety to recommend regulatory reforms to assure existing and new Department facilities are most effectively and efficiently regulated with regard to nuclear safety The safety functions considered will include facility safety, worker protection, emergency response, and protection of the public and the environment from radiological hazards.

The Secretary has asked the Advisory Committee for their recommendations and a final report this year.

The Committee is co-chaired by John F. Ahearne, Executive Director of Sigma Xi and former Chairman of the U.S. Nuclear Regulatory Commission, and Gerard F. Scannell, President of the National Safety Council. The Committee consists of 24 members drawn from the Federal, State, and private sectors. Membership is focused on persons with environment, safety and health backgrounds as well as those with nuclear safety expertise, balanced to represent different nuclear, radiation and environmental protection, and regulatory experience.

Chairman Myers. Could you provide some background information on the Department's policy on the National Environmental Policy Act (NEPA) issued last June?

Dr. O'Toole. The National Environmental Policy Act process is a valuable planning tool that provides an opportunity to improve the quality of the Department's decisions and build public trust. The National Environmental Policy Act's purpose is to foster better decision making by ensuring an open and informed decision making process.

Secretary O'Leary on June 16, 1994, announced a new policy to streamline the National Environmental Policy Act process. The goal is to reduce the median completion time of an environmental impact statement from 33 months to 15 months within two years. The National Environmental Policy Act process improvements include giving field organizations the authority to approve environmental assessments and issue findings of no significant impact; shortening the review process with a consensus-building team approach; emphasizing quality, timeliness and performance incentives; enhancing public participation, especially in environmental assessments; and encouraging innovative approaches to National Environmental Policy Act compliance.

Chairman Myers. What were the objectives of this policy statement?

Dr. O'Toole. The objectives of the June 1994 Secretarial Policy Statement on the National Environmental Policy Act were to make the National Environmental Policy Act process work better, cost less, and be more useful to decision makers and the public.

Chairman Myers. Has the Department made any progress in improving the NEPA review process?

Dr. O'Toole. Yes. Delegation of environmental assessment approval authority to heads of field organizations has streamlined the process and saved thousands of dollars per document. Through teamwork, high priority National Environmental Policy Act reviews have been completed on a fast track, thereby saving significant costs. Several site-wide environmental impact statements in preparation, for example, Nevada, Pantex, and Los Alamos, will save hundreds of thousands of dollars by addressing multiple projects in a single, comprehensive document, while reducing the likelihood of successful lawsuits challenging activities at these sites.

In addition, the National Environmental Policy Act Contract Reform Process Improvement Team report recommends further ways to cut contractor costs, through such means as performance incentives, better management, and fixed-price contracts where appropriate.

Chairman Myers. The budget requests $1.9 million to expand the ES&H Mentoring Program. Please elaborate on the new initiatives planned for this program? Is it reasonable to expect that a program of this nature (one that provides technical assistance to the sites at their request) would result in reductions in oversight inspections and reviews?

Dr. O'Toole. The Environment, Safety and Health Mentoring Program provides onsite assistance to line management to facilitate lasting improvements in safety and health management. Mentoring focusses on process improvement of environment, safety and health management in the field. Department of Energy oversight expends greater effort on weaker areas. As field programs improve with mentoring assistance, the need for oversight steadily decreases. For example, at the Hanford 242-A Evaporator, a scheduled three-week fire protection assessment was curtailed after four hours due to identified improvements in conduct of operations that had been facilitated by the Mentoring Program. Also, at Hanford K-Basins, an assessment by the Office of Environmental Management was postponed due to the fact that Westinghouse Hanford Company and the Richland Operations Office had identified problems in conduct of operations and were actively working with the Office of

Environment, Safety and Health Mentoring Program to correct the self-identified problems.

Chairman Myers. How many site representatives have you assigned to each DOE site in fiscal year 1995 and planned for fiscal year 1996?

Dr. O'Toole. Currently, we have 36 site residents at 11 locations including Headquarters, and we are in the process of hiring 11 more site residents. Present site resident assignments are as follows Savannah River - 5 residents, Oak Ridge - 6 residents, Fernald - 2 residents, Richland - 4 residents, Idaho - 4 residents, Oakland/Livermore - 1 resident, Rocky Flats - 5 residents, Los Alamos/Sandia - 1 resident, Pantex - 2 residents, Yucca Mountain - 1 resident, and Headquarters - 5 residents.

Chairman Myers. What are the duties of each representative?

Dr O'Toole. The Office of Environment, Safety and Health Residents provide day-to-day, onsite monitoring of environment, safety and health and safeguards and security policies and programs at key Department of Energy sites to determine line management's effectiveness in protecting workers, the public, the environment, and national security interests. The individual Residents observe and appraise Department of Energy programs at assigned sites and maintain liaison with other Department of Energy elements. The Residents provide two critical functions within the independent oversight organization: real-time surveillance of Department of Energy and contractor line management activities, and support to the other Oversight Offices in the conduct of inspections, reviews, and special studies and the analysis of appraisal data. Surveillances conducted by the Residents are the centerpiece of Office activities. These surveillances provide real-time input to the oversight management information system, the master appraisal schedule process, and the preparation and maintenance of site profiles.

HEALTH STUDIES

Chairman Myers. There is a $17 million increase for the Health Studies program. Please address the specific activities that will be supported by the increase.

Dr. O'Toole. The budget request for Health Studies reflects our commitment to promote and to protect the health of all Department of Energy workers as well as the health of the communities that have hosted our sites throughout more than forty years of nuclear weapons production. It is an investment in prevention that will pay off many times over in the future.

Our requested increase of $18 million would support a number of important activities. $6.0 million of the increase is for the medical surveillance program in accordance with the Defense Authorization Act of 1993, including $3.0 million for startup of the former worker medical surveillance program and $3.0 million for expansion of the epidemiologic surveillance program.

We have requested an increase of $4.0 million for epidemiologic studies being conducted under the Department's memorandum of understanding with the Department of Health and Human Services. Studies supported by the increase include thyroid disease, cancer in workers at Rocky Flats, childhood leukemia and parental exposure to ionizing radiation, multiple myeloma in workers, and civilian nuclear workers.

$3.0 million of the requested increase would support commitments under State Health Agreements whereby we provide grants to states hosting Department of Energy facilities to determine the impact of operations of those facilities on the health of the surrounding communities.

An increase of $3.0 million is requested to support collaborative studies on the health efforts resulting from the Chernobyl nuclear reactor accident, and a U.S./Russian Federation joint research program on the health and environmental effects of radiation. These studies are expected to fill in critical gaps in our understanding of the risks associated with radiation exposure, and will be directly applicable to the thousands of workers who will be engaged in environmental cleanup at nuclear facilities in the United States.

Finally, an increase of $2.0 million is requested for the Radiation Effects Research Foundation, the organization that conducts long-term research on the health effects of the bombing of Hiroshima and Nagasaki. The United States contribution to this co-funded activity has suffered because of the continued decline of the dollar versus the yen.

Chairman Myers. Section 3162 of the FY 1993 Defense Authorization Act directs the Department to initiate a comprehensive program to monitor and provide medical evaluation and surveillance to all former, current, and future DOE employees exposed to hazardous or radioactive substances. What is the status of the implementation of this requirement?

Dr. O'Toole. There are five major components of the Office of Environment, Safety and Health's medical surveillance program.

The first of these is the Beryllium Health Surveillance Program for Current and Former Workers. The purposes of this program are: (1) to identify current and former Department of Energy and contractor employees who have worked with beryllium; and (2) to provide enhanced medical monitoring for early identification of chronic beryllium during current and past operations. Pilot programs are currently operating at the Rocky Flats Plant and the Oak Ridge Y-12 Plant. Based on the results of the two pilots, the program will be expanded to three additional sites.

The second is the Rocky Flats Plant Health Surveillance Program for Former Radiation Workers. In 1980, the Rocky Flats Plant initiated a medical recall program for former employees who received doses greater than 0.5 rem per year from internally deposited radionuclides. In 1992, the Office of Environment, Safety and Health was assigned management of the program which at that time included about 340 eligible former employees. The criteria for inclusion has changed to 40 rem lifetime effective dose equivalent exposure to both internal and external radiation and it is now expected that between 500 and 700 former employees will be eligible for the program. Medical examinations include bioassay tests and body counting to provide better estimates of lifetime dose, and a complete health history is collected. The health experiences of this group are given to the National Institute for Occupational Safety and Health to help form hypotheses for epidemiologic analyses. This program will be expanded to Hanford, Los Alamos National Laboratory and other sites.

The third is the Exposure Assessment Demonstration Pilots for Current Workers. This program is designed to establish working models for the inclusion of exposure assessments into routine work planning. Pilots are underway at the Hanford Tank Farms and at Rocky Flats. There has been full union involvement in the design and implementation of the pilots. There are plans to expand the program by initiating pilots at specific operations or areas of the Pantex and Fernald sites. The exposure assessment model program will eventually be made available to other areas on the pilot sites and to other sites.

The fourth is the Medical Surveillance Information System for Current Workers. The Medical Surveillance Information System provides for the combined use of clinical patient/employee information to target at-risk populations at Department of Energy sites, and to detect the presence of worker illness and injury at the earliest possible time. This capability allows for better opportunities to prevent future occurrences. The system is a tool for the site occupational physicians, allowing for clinical and exposure information to be used in a relational way to provide for enhanced secondary preventive intervention.

And finally, we have entered into a Memorandum of Understanding with the Department of Health and Human Services for Section 3162 Medical Monitoring for Current and Former Workers. The Memorandum of Understanding sets forth the framework for collaboration between the Department of Energy and the Department of Health and Human Services to carry out the medical monitoring mandates of Section 3162. The designated point of contact for the Department of Health and Human Services is the Director, Centers for Disease Control/National Institute of Occupational Safety and Health. Initial National Institute for Occupational Safety and Health activities under the Memorandum of Understanding include the development of medical monitoring and exposure assessment tools for worker surveillance.

Chairman Myers. What is the associated cost in fiscal year 1996?

Dr. O'Toole. The FY 1996 budget request for these activities is $9.5 million.

Chairman Myers. We understand that the Department's epidemiology program on Beryllium covers activities at two locations -- Rocky Flats and Y-12. Are there any other sites that are candidates for similar beryllium studies? If so, how many?

Dr O'Toole. Eighteen additional sites have been identified as having had beryllium operations, and we estimate that as many as 10,000 workers at these sites may have been exposed to beryllium. A listing of the eighteen additional sites is provided for the record.

Albuquerque Operations Office (7)
Inhalation Toxicology Research Institution (ER)
Kansas City Plant (DP)
Los Alamos National Laboratory (DP)
Mound Facility (DP)
Pantex Plant (DP)
Pinellas Plant (DP)
Sandia National Laboratories (DP)

Chicago Operations Office (3)
Ames Laboratory (ER)
Argonne National Laboratory (ER)
Fermi National Accelerator (ER)

Oak Ridge Operations Office (2)
Oak Ridge Gaseous Diffusion Plant (EM)
Oak Ridge National Laboratory (ER)

Richland Operations Office (2)
Westinghouse Hanford Company (EM)
Pacific Northwest Laboratory (ER)

San Francisco Operations Office (3)
Energy Technology Engineering Center (NE)
Lawrence Berkeley Laboratory (ER)
Lawrence Livermore National Laboratory (DP)

Schenectady Naval Reactors Office (1)
Knolls Atomic Power Laboratory (NE)

Chairman Myers. Are there any plans to expand the program to those sites?

Dr. O'Toole. We are evaluating expansion of the beryllium worker health surveillance program to these additional sites.

Chairman Myers. Is there an estimate on the cost of expanding the program to other sites?

Dr. O'Toole. In the FY 1996 budget we have requested an increase of $1.24 million over the FY 1995 level of $2.6 million. The increase would allow us to expand the program to three additional sites.

SALARIES AND EXPENSES

Chairman Myers. The FTE request for fiscal year 1996 is an increase of 70 above fiscal year 1994. In addition to this increase in federal staff, the budget reflects an increase in administrative support contractors. How do these increases track with the Administration's announcement to downsize the Department by approximately $14 billion over the next five years?

Dr. O'Toole. One of Secretary O'Leary's priorities has been and will continue to be, especially during downsizing, the health and safety of Department of Energy and contractor workers. As during change-of-shift in an emergency room, times of transition, including downsizing, management changes and mission conversions, are times of high risk to workers. We must redouble our vigilance during these periods.

The lion's share of our increase in personnel is going to support the protection of worker health and safety in the environmental management program. The new positions are going to change the mixture of professional skills in our office. We are shifting from a preponderance of experts in nuclear safety and engineering - most appropriate for weapons production - to a group of experts in nuclear safety and traditional industrial and construction safety and health. Without this shift in skill mix we will not be able to adequately address the health and safety problems inherent in dismantling the weapons complex and disposing of its residue.

The focus on changing our skill mix to reflect the Department of Energy's changing mission plus the requirement for enhanced vigilance during transition, coupled with new mandates on my office, such as the Defense Authorization Act's provision that we conduct medical monitoring on our 600,000 former workers, means that we cannot do our job without more people. The increase in contractor support services closely parallels the increase in personnel. The new personnel are not replacing contractors because the Office of Environment, Safety and Health mission is expanding and changing. We are doing a bottom-up review of our use of support contractors that we expect to result in a consolidation and decreased overhead costs.

Chairman Myers. Provide a list of the support contractors that service your organization (including nuclear safety) identified by primary purpose, cost, and FTEs in fiscal years 1994, 1995, and 1996.

Dr. O'Toole. The information requested is being gathered and will be provided for the record by April 14, 1995.

Chairman Myers. Does your budget include any dollars for educational outreach initiatives? If so, provide a description of the initiatives and the associated cost. Also, identify where they are included in the budget.

Dr. O'Toole. Yes, our FY 1996 budget requests $2,751,000 for education outreach activities, including the Health Physics Fellowship Program, the Industrial Hygiene Fellowship Program, the Faculty Research Grants Program, and the Minority Grants Program. These programs support over 60 graduate level students at over 20 academic institutions across the U.S in critical job shortage disciplines to provide the Department of Energy with essential staff. Fellowships attract the top 5 percent of four year school graduates. Greater than 75 percent of fellowship graduates are employed in the DOE complex, plus a three month practicum at a DOE site as part of the program. Faculty Research Grantees are teamed with a Department of Energy site to do research in DIRECT support of the site.

Chairman Myers. The Department has acknowledged the need to enhance the technical expertise of the federal staff with an increased emphasis on training activities. Could you provide for the record how much was spent on training for fiscal year 1993 and fiscal year 1994 including the cost of developing in-house courses.

Dr. O'Toole. The Office of Environment, Safety and Health spent approximately $18 million on training activities in FY 1993 and $18 million in FY 1994.

Chairman Myers. Please provide a comparable estimate for the DOE contractor organizations.

Dr. O'Toole. The Department does not maintain budget information on Department of Energy-wide contractor training The Department is in the process of developing a computerized tracking system for this purpose. We estimate that in FY 1994 management and operating contractors spent $40.2 million in environment, safety and health training for their employees.

Chairman Myers. We understand that the DNFSB has requested copies of all employment applications for all technical personnel, GS-5 and up, who were hired by the Department during fiscal year 1994. What was the purpose of this request? How many applications were involved?

Dr O'Toole. The Defense Nuclear Facilities Safety Board requested the information to evaluate the implementation of Recommendation 93-3, Improved Technical Capability, with respect to the technical qualifications of new hires as compared to the Position Descriptions and the Vacancy Announcements. The Department provided the Board with the SF-171 Standard Federal Employment Application Form and the corresponding Position Description and Vacancy Announcement for the 470 technical positions that were filled in calendar year 1994. The information provided to the Board did not include names and social security numbers; and it was broken down with respect to program and office location.

SECURITY EVALUATIONS

Chairman Myers. With the end of the Cold War and the subsequent downsizing of the Department's weapons complex, has there been any change to the Department's approach to the Security Oversight program?

Dr. O'Toole. The end of the Cold War does not necessarily end the number and variety of threats to national security and the security of the Department For example, the Department's inventory of plutonium and enriched uranium will increase significantly as weapons are returned for dismantlement; this material still must be protected against terrorists and hostile nations that are intent on accumulating nuclear materials Further, classified and sensitive information must be protected, the increases in computer networking, combined with increased sophistication of computer hackers, makes protecting this information more difficult. Consequently, the Department must maintain a viable security oversight program to determine the effectiveness of its safeguards and security programs. However, there have been significant changes to the Department's Security Oversight program since the end of the Cold War. The Oversight program has evolved in response to the ever changing nature and magnitude of the threats to the Department's security interests For example, there is much less emphasis on operations security as the Department's facilities transition from its former weapons production mission to one that focuses on environmental restoration. Conversely, there has been more emphasis on computer security as the Department's facilities use more and more computer networks, which are increasingly accessible from all over the world.

Chairman Myers. Has there been a corresponding decrease in the size of the Security Evaluations organization?

Dr. O'Toole. Significant reduction has been possible, primarily because there are fewer facilities with active nuclear processes. For example, the Security Evaluations organization, which implements the oversight program, had about 40 FTEs during the late 1980s; it now has approximately 22 FTEs

Chairman Myers. Last year it was reported that the Department's security program has achieved success in several areas, including reduction of security clearances and protection of special nuclear material; but it was also reported that improvements were needed in the protection of classified information. What progress has been made in addressing that concern?

Dr. O'Toole. Significant progress has been made in improving the protection of classified information. For example, the consolidation of Department of Energy orders, which specify the requirements for protecting classified information, was a significant accomplishment. Most facilities have made progress in protecting classified documents and material. However, protection of classified information on computer systems is still viewed as a significant challenge because of the increasing movement toward computer networking and interconnections to global networks such as the Internet. While there are many benefits to global communications such as envisioned in the "Information Superhighway", the increased computer connectivity, together with the increases in espionage and the capabilities of hackers, presents continually increasing challenges The Security Oversight program is continuing to focus on these threats and has developed sophisticated tools to test the effectiveness of computer security systems. Although much progress has been made, protection of information on computer systems is viewed as an area that requires continued attention.

Chairman Myers. In fiscal year 1994, how much funding from this program was used to support other ES&H activities such as the radiation experimentation program or declassification efforts of the Department?

Dr. O'Toole. In fiscal year 1994, the Office of Security Evaluations spent $1,600,000 on declassification and human radiation experiments activities.

Chairman Myers. Why does the Department have individual safeguards and security offices within each program organization as well as an overall Office of Safeguards and Security? Doesn't this complicate implementation of safeguards and security policies throughout all Departmental facilities?

Dr. O'Toole. The Headquarters Office of Safeguards and Security is responsible for setting Departmental safeguards and security policies. Field elements are responsible for implementing these policies at their facilities. Our job in the Office of Environment, Safety and Health is solely to perform independent safeguards and security oversight.

As the Headquarters program offices grew in strength, their programs grew, and the resulting impact of the line management oversight role became burdensome on field operations. The aggregate of these line management oversight activities represents a varied assortment of reviews, appraisals, and audits that were uncoordinated, dissimilar, and frequently unproductive. Current initiatives are underway that are designed to cause the Headquarters program offices to better design, coordinate, and conduct their oversight activities.

Chairman Myers. Your statement says there will be four safeguards and security audits in fiscal year 1996, but the budget request identifies 14. Please explain.

Dr. O'Toole. Currently, during fiscal year 1995, the Office of Security Evaluations is planning to conduct four comprehensive inspections, six short notice safeguards and security readiness reviews, and four special studies such as the study that addressed nuclear-related property and documentation released by the Department since 1989. The total of planned inspection and review activities for the Office of Security Evaluations is 14.

The fiscal year 1996 budget request anticipates a total of 14 inspections consisting of comprehensive inspections, safeguards and security readiness reviews, and special inspections.

Chairman Myers. Please characterize the results of security evaluations conducted at DOE sites during the last year.

Dr. O'Toole. The Security Evaluations Annual Report for FY 1994 provides a detailed assessment of the inspections conducted and the overall status of the Department of Energy protection programs. The results of Security Evaluations inspection and assessments activities are briefly summarized as follows.

Strengths in the FY 1994 program include improved physical security system performance, improved protection force performance, consolidation of policy, and improved resource management.

There are a number of positive indicators in the area of protection of special nuclear materials Some sites have reduced their reliance on the protective force, thus decreasing costs Timely, cost effective maintenance has generally improved physical security system performance, despite aging electronic components The material control program is generally effective. However, vulnerability assessments are not always comprehensive, and key elements of the protection systems have not been tested. Quality control is an ongoing concern Deficiencies in materials accounting undermine the effectiveness of material control programs A coordinated effort will be needed to assure the Department's fissile inventory values. Overall, the various elements in protection of special nuclear materials are not always well integrated.

Protective force performance has improved, but physical security and material control and accountability programs are not performing as well An emerging concern that transcends the traditional boundaries of safeguards and security is associated with shortcomings in special nuclear materials measurements. the Department's nuclear material measurements program does not meet international standards.

A major consolidation of information protection policy was achieved by the Department of Energy in FY 1994 Modified accountability, reduced classified holdings, and positive trends in computer security contribute to protection of information. The administration of work-for-others programs has improved markedly.

In spite of these improvements, widespread concerns remain in some areas of computer security and other aspects of information protection. Requirements for computer system accreditation and certification are not always met, and problems surfaced regarding the identification and protection of sensitive, unclassified information processed on computer systems.

While most elements of the personnel security program showed positive results in FY 1994, the personnel security assurance program, intended to enhance the clearance program primarily for those with direct access to special nuclear material, has remained a concern. Concerns about the personnel security assurance program offset some areas of modest improvement in management and oversight.

Reduced access requirements for foreign nationals suggest a need for increased vigilance in protecting sensitive unclassified information.

The Department's increasing responsibilities in non-proliferation and environmental restoration will affect the evolution of its safeguards and security program Non-proliferation considerations constitute a large and growing area of concern for safeguards and security management.

Fiscal Year 1994 saw the completion of most Site Safeguards and Security Plans, significant reductions in cost, and improved inspection ratings.

Chairman Myers. How would you characterize the status of the Department's overall safeguards and security posture? Can cost savings be achieved in any areas? What improvements should be made?

Dr. O'Toole. Overall the safeguards and security program of the Department has improved. A number of significant indications of progress were observed within management and oversight during FY 1994. Nearly all Site Safeguards and Security Plans have been completed. However, improvements are needed in the analyses that underlie the levels of risk accepted in many Site Safeguards and Security Plans.

Some sites have reduced their reliance on the protective force, thus decreasing costs. Timely, cost effective maintenance has generally improved physical security system performance, despite aging electronic components.

Reducing the backlogs in clearance investigations has increased timeliness in granting clearances.

Mission changes and consolidation of security interests into fewer security areas have provided opportunities for substantial cost savings and/or cost avoidance in the protective force and physical security systems.

Further reductions and cost savings can be achieved by reducing the program management's security organizations which are providing duplicative functions within the line organizations.

The Department's policy for protecting its large inventories of Secret and Confidential materials, such as weapons assemblies/parts, high explosives, and classified equipment/tools, needs to be re-examined.

Significant concerns remain in all areas of safeguards and security including material accounting, excessive reliance on protective force, aging physical security systems, computer security, and management and oversight.

NUCLEAR SAFETY

Chairman Myers. What is the role of the nuclear safety representative?

Dr. O'Toole. Prior to July 1994, the Nuclear Safety Site Representatives and the Office of Environment, Safety and Health Site Representatives reported to different organizations. Recently as part of the reorganization of the Office of Environment, Safety and Health, we have combined these two activities into a single Office of Environment, Safety and Health Residents in the Office of Oversight. The role of the site representatives is to perform surveillance of field activities and identify safety issues, maintain site profiles which are used to evaluate contractor and Department of Energy line management performance, and track corrective actions.

Chairman Myers. The measure of the effectiveness of the nuclear safety site representatives should be improvement of contractor operations Reports indicate that some relationships between site representatives and field and contractor personnel are so combative as to be counterproductive. How are you dealing with communication problems in this area?

Dr. O'Toole. There were problems identified by field and contractor management in their interfaces with the Nuclear Site Representatives, including directing field and contractor personnel to make change without recognizing line management authority, and inconsistent findings not related to Department of Energy requirements. To correct this problem we have combined nuclear and non-nuclear site representatives in one office, established new protocols/procedures for dealing with field and contractor management on issues, and recognized line management's responsibility for safety.

Chairman Myers. What types of improvements in nuclear safety performance are still needed?

Dr. O'Toole. The end of the Cold War and cessation of weapons production has resulted in a dramatic change in mission direction that today reveals a vast legacy of hazards that the Department of Energy must face. These hazards include environmental contamination, hazardous materials inventories, aging and decrepit facilities, and new, unfamiliar missions.

Two vulnerability studies, one examining plutonium and another spent fuel at Department of Energy sites, conducted by my office over the last 18 months present vivid examples of the nuclear hazards and challenges facing the Department of Energy and its workers. Before these studies, the Department of Energy management knew of recurring incidents in these areas, but had no clear path that described exactly where or how serious the hazards were These studies are not sitting idly on bookshelves in Department of Energy libraries. They have dramatized safety and health concerns for a number of audiences, and, most critically, they have acted as road maps driving management decisions and have been instrumental in redirecting attention and resources toward the most urgent risks.

Each vulnerability study has been accompanied by a management action plan put together by the program offices that maps out a site-by-site strategy to eliminate existing vulnerabilities and prevent their recurrence. We are now working with the responsible program managers to implement these corrective action plans which span several years. We will begin another vulnerability study on highly-enriched uranium later this year.

MARSHALL ISLANDS

Chairman Myers. Please describe the Marshall Islands program to be conducted in fiscal year 1996.

Dr. O'Toole. The Marshall Islands dose assessment program conducts environmental sampling, island characterization and individual monitoring under mandate of Public Laws 99-239, 99-205 and 95-134. This monitoring provides a better understanding of residual radioactivity remaining in the environment and local foods, and permits exposure assessment for populations and individuals currently living on or planning to resettle to one of the four affected atolls.

The Marshall Islands Medical Program provides comprehensive medical surveillance and quality medical care for the exposed population of Rongelap and Utirik Atolls that experience radiogenic related diseases. Within 10 years after the high acute radiation exposure to the thyroid, the population of Rongelap developed thyroid tumors and were treated to prevent the development of thyroid cancer One leukemia case in the exposed population has been noted. Today the Marshall Islands is noting an increase in thyroid nodular disease, mostly benign in nature.

Chairman Myers. Please identify by category and location where fiscal years 1995 and 1996 funding is planned for expenditure.

Dr. O'Toole. The information requested is provided for the record.

Marshall Islands Medical Program	Budget Thousands of Dollars FY96	 FY95
Brookhaven National Laboratory Medical Mission Program................	$ 830.0	$ 785.0

- Provides comprehensive medical surveillance of the exposed population and provides quality medical care for those that experience radiogenic related diseases.
- The exposed population of Rongelap and Utirik Atolls are followed for any possible condition that may be related to their exposure to fallout from the atmospheric nuclear weapons test "Bravo".
- Two medical missions are conducted in the Marshall Islands at four locations to facilitate the medical examination and surveillance of these patients.
- American physicians volunteer their valuable services to make this extensive medical coverage available in this isolated section of the world.

	FY96	FY95
Medical Referral Costs..	$ 550.0	$ 500.0

- Patients that develop conditions that may be related to their exposure and could lead to cancer or other radiogenic related disease are referred to fully equipped medical facilities where necessary tertiary diagnostic and medical care can be provided.
- Tertiary care is delivered at the Straub Clinic in Honolulu, Hawaii. This is the closest facility that has all the diagnostic and treatment modalities, modern surgical capabilities, and proper medical expertise and credentials to perform needed medical care.
- With the aging Marshallese patients and the recent need to followup on ultrasound detection of thyroid nodules and breast nodules, medical referral costs are increasing each year.

	FY96	FY95
Pacific Logistics Operations..	$1,895.0	$2,145.0

- Provides a logistics ship platform and facilitates/funds logistics supply, technical assistance, interface with Marshall Islands dignitaries, and travel capability throughout isolated northern atolls to facilitate the implementation of 4-5 medical, environmental monitoring and dose assessment missions each year.

- Maintain and operate a Field Station at Bikini Atoll for staging environmental monitoring missions, maintaining bulldozers, trucks, and other clearing equipment that make possible grid characterization on Marshall Islands atolls that need to be characterized for residual activity.

- Hires local Marshallese to assist in various parts of program missions.

- Supports the operations necessary to get medical referral patients to needed medical facilities for medical care and treatment.

Marshall Islands Environmental Monitoring Program..........................$2,275.0 $2,105.0

- Provides for complete characterization of the four most affected atolls to determine the residual activity remaining in the soil and in vegetation that is to be used as food.

- Establishes mitigation techniques that will assist the Marshallese in effectively reducing the uptake of radioactive cesium into the plants they eat.

- Provides the environmental data necessary to estimate dose to resettling populations to facilitate their plans for return to their homelands.

- Maintains agricultural gardens at Bikini Atoll to improve our understanding of the uptake of radionuclides in plants and vegetation and the environmental half-life of these radionuclides in the special coral soil in the Marshall Islands.

Marshall Islands Dose Assessment Program..$ 780.0 $ 795.0

- Provides baseline urine bioassay and whole-body counting for the Rongelap, Bikini, and Utirik people who reside on or are planning to resettle to their respective atolls.

- Establishes baseline internal dose assessment for those populations considering resettlement.

- Provides the screening technology to detect plutonium in human samples and the capability to detect very low levels of plutonium when there is a need to verify exact levels in the body.

TOTAL FY 1996 PROGRAM COST.................................$6,330.0 $6.330.0

Capital Equipment..$ 470.0

Capital Equipment funds in the amount of $470,000 are needed to replace aging equipment for use in the Marshall Islands Program. This equipment includes: one brush hog tractor; equipment and shielding to upgrade the portable x-ray trailer; two replacement generators and maintenance parts associated with DOE environmental monitoring, dose assessment, and logistical support; three germanium detectors; four urine bioassay columns, one track counting microscope, four shipping containers; upgrades for the whole-body counting trailer to support personnel monitoring missions, two gamma spectrometry detectors; air resuspension equipment; one microwave muffle furnace; two multichannel analyzers to support collection and analyzation of environmental samples.

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

Chairman Myers. The Defense Nuclear Facilities Safety Board issues many recommendations dealing with nuclear safety issues. Because of the prominence of the Boards recommendations, does the Department find that it is forced to commit resources to nuclear safety issues at the expense of other pressing safety issues throughout the complex?

Dr. O'Toole. The Department evaluates and prioritizes its commitment of resources based upon the hazards determined to exist as well as the costs versus benefits of the effort. The Department retains the responsibility to establish priorities for solving safety issues throughout the complex and works with the Defense Nuclear Facilities Safety Board to determine a mutually agreed upon course of action should the Department find that resources are required in other areas that have a greater need than those determined by the Board.

Chairman Myers. When the Department receives a recommendation from the Board, is the Department's cost of implementing the recommendation a consideration which is discussed with the Board? In times of declining resources, are lower cost options for implementation ever considered and approved?

Dr. O'Toole. When the Department develops an Implementation Plan in response to a Recommendation, it does so in consultation with the Defense Nuclear Facilities Safety Board and its staff. Alternative courses of action are explored to ensure that the Department's commitments are achievable in terms of time and resources, and still satisfy the concerns of the Defense Nuclear Facilities Safety Board.

REGULATORY REFORM

Mr. Fazio. I'm sure that you have been following the debate in congress on risk assessment and other aspects of regulatory reform. The debate on regulatory reform has focused sharply on alleviating regulatory burdens by requiring agencies to analyze the impacts of their proposed regulations.

I understand that the Defense Nuclear Facilities Safety Board is responsible for providing recommendations about safety issues. I also understand that those regulations have a great impact on your budget.

Approximately how much of your budget is dedicated to dealing with issues raised by the Defense Nuclear Facilities Safety Board?

Dr. O'Toole. The FY 1996 budget request for the Departmental Representative to the Defense Nuclear Facility Safety Board is $1 million and 6 FTE. We are unable to quantify total Department of Energy spending associated with issues raised by the Board.

Mr. Fazio. You obviously have had to make some tough choices in order to comply with the directives of the Safety Board. What other ES&H projects or initiatives have been placed on the back burner in order to comply with the directives of the Defense Nuclear Facilities Safety Board?

Dr. O'Toole. The Office of Environment, Safety and Health management plan identifies priority environment, safety and health projects and we are unaware that any top priority has been displaced by the Department of Energy's response to any of the Defense Nuclear Facilities Safety Board recommendations.

Mr. Fazio. What can we do to streamline the regulatory oversight process to maximize the federal investment in safety programs?

Dr. O'Toole. We are taking steps to address this concern. First, effective December 1994, the Office of Environment, Safety and Health independent oversight structure was formally revised and streamlined. This restructuring will solve many of the identified problems by unifying all the environment, safety, health, and security oversight groups under one umbrella. The net result will be a significant decrease in the number of oversight reviews conducted by my office, with an increase in their quality and usefulness to the field. Also, we believe the newly created independent oversight organization will improve the Department of Energy's performance in environment, safety, health, safeguards and security, and establish credibility with external agencies such as the Defense Board, Occupational Safety and Health Administration, Environmental Protection Agency, and state agencies.

Second, we are working with line management to eliminate redundant functions and groups contained within the program offices. Third, the Secretary of Energy established the Advisory Committee on External Regulation of Department of Energy Nuclear Safety. The purpose of the Advisory Committee is to recommend regulatory reforms to assure existing and new Department facilities are most effectively and efficiently regulated with regard to nuclear safety. The safety functions considered will include facility safety, worker protection, emergency response, and protection of the public and the environment from radiological hazards. The Secretary has asked the Advisory Committee for their recommendations and a final report this year

COMPETITIVENESS OF THE NATIONAL LABS

Mr. Fazio DOE's National Laboratories are under ever increasing pressure to compete for work, especially outside work for the laboratories.

"The Galvin Report recommends" creation the "corporization" of the multi-purpose national laboratories as a solution to the perception that the laboratories devote too much time and resources to responding to micro-management from the DOE's Washington and regional offices Galvin's basic theory is that the labs should be able to do their jobs without all this interference.

Recently, I have heard criticism that the regulatory structure that you administer at environment, safety and health adds to the cost of work for the DOE national labs and makes it difficult for them, to compete for outside work.

Has ES&H conducted any formal analysis of the costs to the laboratories to comply with ES&H's regulations and guidelines?

Dr. O'Toole. We have not conducted a formal analysis of the costs to the laboratories to comply with environment, safety and health regulations and guidelines. It is important to note, however, that environment, safety and health is a fundamental part of doing business. Successful organizations recognize this fact and recognize that good safety, health and environmental protection programs are key to a successful "bottom line." However, recognizing that resources are scarce, the Department has implemented an Environment, Safety and Health Management Planning Process. This process utilizes a risk-based prioritization approach to review line program environment, safety and health budgets, and ensures that all risk-significant environment, safety and health issues are adequately addressed in the Department's budget.

Mr. Fazio. What systems or procedures have you put into place to stream line the regulatory process to make the laboratories more competitive?

Dr. O'Toole. We know that more can be done to make our environment, safety and health programs more efficient and less burdensome. Important steps we are taking include implementing a streamlined standards-based, performance oriented system for all Department of Energy facilities, reducing the number of environment, safety and health orders be clarifying the necessary requirements and eliminating overlapping and outdated requirements, and streamlining oversight at all levels to reduce the burden imposed by multiple layers of oversight reviews.

Mr. Fazio. How do you respond to your critics who claim that time delays and increased costs from your regulations are not justified?

Dr. O'Toole. We believe the actions I have just described should alleviate these concerns.

Mr. Fazio. Are there facilities where you have streamlined the process that could serve as a model for other DOE facilities?

Dr. O'Toole. We anticipate that the ongoing initiatives to streamline requirements and oversight will benefit all Department of Energy facilities.

ENVIRONMENT, SAFETY AND HEALTH OVERSIGHT

Mr. Bevill. The Atomic Energy Act mandates that the Department must promulgate its own regulations regarding worker protection and nuclear safety. How do you feel about this?

Dr. O'Toole. We agree that this issue should be examined. Accordingly, we established the Advisory Committee on External Regulation of the Department of Energy Nuclear Safety The purpose of the Advisory Committee is to recommend regulatory reforms to assure existing and new Department facilities are most effectively and efficiently regulated with regard to nuclear safety The safety functions considered will include facility safety, worker protection, emergency response, and protection of the public and the environment from radiological hazards. The Secretary has asked the Advisory Committee for their recommendations and a final report this year

Mr. Bevill. Would it save money and increase efficiency if the DOE simply adhered to the regulations administered by other federal departments and agencies with responsibility over these issues?

Dr. O'Toole. The work being done by the Advisory Committee on External Regulation will provide answers to the issues you have raised. The Secretary has asked the Advisory Committee for their recommendations and a final report this year.

Mr. Bevill. Would you support legislation that would accomplish this goal?

Dr. O'Toole. I believe it would be prudent to wait for the Advisory Committee on External Regulation of Department of Energy Nuclear Safety to complete their review.

Mr Bevill. Would you please update the committee on your progress in establishing a single office to manage all oversight appraisal functions for Environment, Safety and Health.

Dr. O'Toole. Effective December 1994, the Office of Environment, Safety and Health's independent oversight structure was formally revised and streamlined. This restructuring combined all the environment, safety, health, and security oversight groups under one umbrella. The net result will be a significant decrease in the number of oversight reviews while increasing their quality and usefulness to the field

My office is also working with line management to eliminate redundant functions and groups contained within the program offices

Mr. Bevill. The only program area for which you propose a budget increase is for the Office of Health Studies. Could you please explain to the committee the need for this increase and also discuss the current programmatic thrust of this office.

Dr. O'Toole. The Office of Health Studies sponsors domestic and international studies to increase our understanding of the radiation health effects and the environmental and occupational health impacts of Department of Energy operations. Investigations of the relationships between exposures to radiation and chemicals and consequent health effects among populations is a critical public health function that is key to designing effective strategies. This budget request reflects our commitment to promote and to protect the health of all Department of Energy workers as well as the health of the communities that have hosted our sites throughout more than forty years of nuclear weapons production.

The FY 1996 budget increase of $18 million would be applied as follows. $6 0 million for medical surveillance of current and former workers in accordance with the Defense Authorization Act of 1993; $4.0 million for epidemiologic studies under the Department's memorandum of understanding with the Department of Health and Human Services - these studies provide invaluable data on rates of illness and injury among the current workforce to identify workforce conditions that may pose a health threat; an increase of $3.0 million for State Health Agreements that allow host status to conduct health studies to determine the impact of Department of Energy facility operations on the surrounding communities, an increase of $3.0 million for Chernobyl/Russian Federation radiation studies that are expected to provide extremely valuable data directly applicable to protecting the health of thousands of cleanup workers in the U.S.; and an increase of $2.0 million for the Radiation Effects Research Foundation - an increase that is attributable to the continued decline of the dollar versus the yen.

RADIATION EFFECTS RESEARCH FOUNDATION

Mr. Bevill. Recently it has come to our attention that the Department is terminating its contract with the National Academy of Sciences to serve as the managing agent of the Radiation Effects Research Foundation. For almost 50 years, this private, non-profit organization has studied the short term and long term effects of exposure to various levels of radioactivity - providing the scientific community with extremely beneficial data. For all I know, the NAS's track record has been excellent. Would you please explain, for the committee, the reasons why the Department reached this decision, your plans for the administration of DOE's role in RERF, and the process of identifying a successor to the NAS.

Dr. O'Toole. For over a year, we have discussed with the nations's leading radiation scientists and former Radiation Effects Research Foundation Directors the best ways to preserve the Radiation Effects Research Foundation mission despite increasing financial constraints and to leverage its unique capabilities and expertise to train a future generation of scientists. The paucity of researchers equipped to pursue questions about health and ionizing radiation is of great concern to the experts who were consulted and to the Department of Energy, whose responsibilities demand a commitment to further the understanding of the health impacts of radiation. The decision to compete the Radiation Effects Research Foundation management contract among universities was based solely on our desire to strengthen graduate training. The Department of Energy has no intention of influencing the Radiation Effects Research Foundation research agenda.

In our negotiations and decisions, we have kept our process open and transparent. In December 1994, we informed the National Academy of Sciences of our intent to seek a university grantee. We have done our best to keep all parties abreast of our intentions. Through our communication with the scientists, Radiation Effects Research Foundation officials and the Japanese government, we have endeavored to assure a smooth, constructive transition. We recognize that transition is painful. Many parties feel a responsibility to insure the continued excellence, viability and independence of the Radiation Effects Research Foundation, including its staff and directors, the Japanese government, former and current National Academy of Sciences employees, the international scientific community, the Department of Energy, and most importantly, the citizens of Hiroshima and Nagasaki. We are committed to insure that the personal lives of the researchers are not disrupted, and more importantly that the work continues in an independent, productive manner.

We are confident that transfer of the administrative support grant to an independent American university will maintain the appropriate intellectual and managerial distance between the work of the Radiation Effects Research Foundation and the Department of Energy and will continue to foster the highest quality research and to encourage the development of a new generation of radiation scientists.

Statement of
Tara O'Toole, M.D., M.P.H.
Assistant Secretary for Environment, Safety and Health
U.S. Department of Energy
to the
Subcommittee on Energy and Water
House Committee on Appropriations
March 8, 1995

Mr. Chairman and Members of the Committee:

I appreciate the opportunity to present the Department of Energy's (DOE) Fiscal Year 1996 budget request for the Office of Environment, Safety and Health.

As Secretary O'Leary said in presenting the overall Fiscal Year 1996 DOE budget, each federal program and agency has been challenged to "do more with less." I believe that our budget request shows that the Office of Environment, Safety and Health has met that challenge, and has done so while finding resources needed to address serious hazards at our nuclear weapons complex that threaten the health and safety of DOE workers and the public near our facilities.

Our total budget request for Fiscal Year 1996 is $222.6 million, slightly lower than our request for the previous year and lower than than our Fiscal Year 1993 appropriation. To achieve efficiencies and accommodate new priorities, we eliminated more than $4 million in spending on several lower priority or completed programs. Savings were also realized through reduced use of support service contractors, consolidation of administrative functions (e.g., travel, training, information management), and reduced redundancies throughout the organization.

THE OFFICE OF ENVIRONMENT, SAFETY AND HEALTH: OVERVIEW

The Office of Environment Safety and Health seeks to ensure that Department of Energy (DOE) activities protect the environment, worker, and public health and safety and helps the Department's programs implement increasingly effective and efficient strategies to meet this goal. Since we testified before this committee last year, the Office of Environment, Safety and Health has been reorganized to make this goal the explicit rationale behind all our activities and to more effectively target our resources.

The new organization represents a radical departure from its predecessors. We recognize that the responsibility for implementing health and safety programs rests with managers of line programs such as Environmental Management and Defense Programs. We also recognize that safety must be managed; it cannot be "inspected in." But the Office of Environment, Safety and Health will no longer judge its successes by the number of inspections it performs, or the pages of new policy it issues, or the number of deficiencies or non-compliance it discovers in program activities. Instead, we have explicitly linked our own organization's success -- which we will track and measure -- to the success of the programs in making DOE and its facilities "safer" (where "safety" is shorthand for the full range of environment, safety and health protection activities).

As the Defense Nuclear Facilities Safety Board -- and many other critics of DOE -- have noted, the Department's programs lack sufficient managerial expertise in environment, safety and health. Departmental programs are executing technical training programs and have made use of "excepted service" hiring authority to help remedy this situation. In the near-term however, the Office of Environment, Safety and Health constitutes DOE's "corporate resource," i.e., the major source of expertise in disciplines such as environmental protection, nuclear safety engineering, public health, industrial hygiene, radiation protection, construction safety, risk management, epidemiology, and occupational medicine. We have put in place an organization designed to leverage the talent in the Office of Environment, Safety and Health to meet our goal of "making it safer" for those who work within or live nearby DOE operations.

The Office of Environment, Safety and Health has embarked on this new direction in part because the best in the private sector --companies like AT&T, Mobil, Dow and Monsanto -- have demonstrated such an approach to be both successful and effective. We are determined to pursue this course because the need for environment, safety and health improvements, particularly at the Nuclear Weapons Complex, is urgent.

The Department, and indeed the Nation, can no longer afford to simply react to enviromental releases or to realized threats to workers and the public. We must instead institute effective programs to **prevent** contamination of the environment, and to **forestall** injuries and illnesses among workers engaged in environmental cleanup and decontamination and decommissioning of old facilities. I believe, Mr. Chairman, that it is important to look at our efforts in environment, safety and health as they are viewed by the best in the private sector -- as both essential to ethical management of our operation in terms of lives saved and injuries and illnesses avoided, and financially prudent in terms of dollars and cents.

For example, properly implemented hazard identification as part of a worker medical surveillance programs can detect or diagnose symptoms early and allow us to intervene to **prevent** disease, potentially saving taxpayers millions of dollars in avoided lawsuits and health care costs; similarly, focused work planning can avoid lost production and worker compensation claims. A 1993 fatal accident at DOE's Hanford site, for example, could have been avoided if a worker opening a valve on an active steam line in an underground concrete pit had planned for the possibility of a steam release in the enclosure. In addition to the individual's death, more than $5 million and significant delays in operations were caused by the accident. These and many other examples demonstrate how an investment in worker safety and health prevention now can provide returns to the taxpayer time and again.

We have put in place an organization and a budget designed to leverage the talent in the Office of Environment, Safety and Health to most successfully meet our goal of making DOE facilities safer for the employees and the communities near our facilities. Our FY '96 budget request reflects a balanced and fiscally prudent strategy for meeting that goal.

COLD WAR LEGACY OF ENVIRONMENT, SAFETY AND HEALTH HAZARDS

Two years ago we came into this office with a mission of protecting health and safety at DOE facilities and confronted the safety and health hazards and the environmental contamination that remained as a legacy of the Cold War. We found nationwide mistrust of DOE competence and doubts about its good faith. The Defense Safety Board, who testified before this committee just weeks ago, told us that the DOE complex was dangerous and getting more dangerous every day. We faced whistleblowers, lawsuits, dramatic turnabouts in mission coming with the end of the Cold War, tremendous environmental contamination, aging, poorly maintained facilities, and an insular culture largely ignorant of modern health and safety standards.

Throughout the Cold War, DOE and its predecessor agencies operated under a national security imperative that subordinated health, safety and environmental considerations to the goals of nuclear weapons production. Weapons production took place in an atmosphere of great secrecy that insulated operations and managers from the environment, safety and health expectations imposed upon and practices developed by the private sector.

In the late 1980s, serious and pervasive environmental pollution resulting from production activities became apparent, and the Department began to grapple with the immense task of coming into compliance with the nation's environmental laws. A series of safety failures and mishaps at DOE reactors resulted in the shutdown of facilities at Hanford, Savannah River and elsewhere. The end of the Cold War and cessation of weapons production has resulted in a dramatic change in mission direction that today reveals a vast legacy of hazards that DOE must confront and manage. These hazards can be grouped into four categories:

Environmental Contamination. As a result of past operations and waste management practices, much contamination is already loose in the environment, polluting ground water, soils and ecosystems. These contaminants can pose public health threats to populations living near our facilities.

Hazardous Materials Inventories. As a result of forty years of nuclear weapons production, DOE today harbors the world's largest inventories of hazardous materials outside of the former Soviet Union. The Office of Environment, Safety and Health recently completed three "vulnerability" assessments that paint a vivid picture of those hazards. For example, there are about 26 metric tons of plutonium throughout the DOE complex, not including the amounts contained in nuclear weapons, resulting from the cessation of weapons production. Plutonium that had previously been recycled into new warheads was therefore left in containers, facilities and circumstances not suited for safe longterm storage. DOE also owns and is housing more than two million kilograms of spent nuclear fuel and other reactor irradiated nuclear materials, much of it stored in conditions that are not suitable or safe in the long term. And, finally, over the past several decades, DOE operations in both our civilian and defense facilities have improperly tracked, stored and disposed of hazardous chemicals, creating potential threats of unplanned chemical reactions, worker exposures, or environmental releases.

Aging and Decrepit Facilities. Our facilities themselves present serious threats to those who must work around and within aging and deteriorating facilities built a half century ago. We lack reliable data for many of these facilities, such as how buildings were constructed, the nature of past uses, inventories of hazardous materials, or the status of electrical and ventilations systems.

New, Unfamiliar Missions. Many workers and managers who will be involved in the cleanup effort at DOE sites are not prepared for the hazards they will confront. DOE 's workforce faces a dramatic change from a mission focused on the manufacture of special nuclear materials and weapons assembly to one of weapons dismantlement, environmental cleanup and decontamination and decomissioning of outmoded facilities. These newer tasks are unfamaliar to most DOE workers and present them with highly dynamic and changing workplaces where hazards can be numerous and varied and exposures unknown and difficult to predict.

THE OFFICE OF ENVIROMENT SAFETY AND HEALTH: HOW IT WORKS

As I noted earlier, the Office of Environment, Safety and Health has sought to model itself after private corporations with the best records in protecting environment, safety and health. An empirical look at such private sector performers reveals two features common to all "best in class" companies.

First, line managers manage safety and health issues as carefully and with as much attention to detail as they manage the corporate bottom line. Safety and health are clearly recognized as the responsibility of managers -- and their performance in these areas is not only measured, but figures prominently in their ratings, promotions, and bonuses.

The second feature of all best-in-class safety corporations is the active participation of the workforce in identifying and mitigating hazards. Excellence in environmental, safety and health performance is achieved when employees and management -- those who are most at risk and stand to gain from program success -- work in partnership.

All of the offices and functions in the Office of Environment, Safety and Health are aimed at incorporating these two features of excellence into DOE practices. The independent oversight functions of our office are designed to show managers where environment, safety and health issues lie, to portray site-wide or program-wide trends in environmental, safety and health performance, and to track management achievments against DOE and industry "best practices." Independent oversight is critical in assuring that federal and contractor managers are held accountable for safety and health performance.

The Office of Environment, Safety and Health has also initiated a number of "business practice" initiatives designed to closely follow line programs' environment, safety and health expenditures, and contract reform provisions that ensure contractors are held accountable for environment, safety and health performance. Last year, for the first time, we were able to show DOE managers, site-by-site, where their safety and health dollars were being spent. This type of information is generally found in the unseen details of program budget overhead. Our office set a consistent matrix for ranking risks and permitted the managers to see if their budgets were in line with what they judged to be the riskiest to safety and health. Again, this is not a command and control exercise but rather a tool for program managers so they can make their own best decisions with regard to safety and health.

We have actively worked on DOE's contract reform initiative to ensure, as is done routinely in the private sector, that managers are held accountable for health and safety performance. To date, these efforts have generated prebid selection criteria for safety and health, a review process for pending operating contracts, provisions for management performance incentives, and "flowdown" of safety requirements to subcontractors. These provisions will be included in new contracts coming up for bid and award.

The other programs in the Office of Environment, Safety and Health -- Environment, Worker Health and Safety, and Health Studies -- each provide expert assistance to the DOE line programs in the form of direct mentoring of federal managers, piloting model programs, identifying best practices in the private sector and translating them to DOE, performing special analyses of environment, safety and health problems and assisting managers in devising solutions. I will now describe each of these offices in more detail.

OFFICE OF INDEPENDENT OVERSIGHT

One of the more critical aspects of our reorganization was the creation of the Office of Independent Oversight. This office is the only source of information about the conduct and adequacy of environment, safety and health that is independent of line programs. Under the Atomic Energy Act, DOE is self-regulating in the areas of worker protection and nuclear safety. The purpose of our oversight program is to provide the Secretary and DOE managers with an important tool -- an independent and unbiased view of how well they are doing in managing for environment, health and safety, and safeguards and security.

The creation of this office signifies a clear departure from prior oversight exercises. In the old organization, several different Deputy Assistant Secretaries conducted oversight assessments that were split among disciplinary lines and often duplicative. Evaluations of nuclear safety, occupational safety, occupational medicine, safeguards and security, etc. were carried out sequentially, resulting in unwarranted burdens on field sites and a fragmented view of environment, safety and health performance. In addition, the former approach to oversight focused on identifying long lists of instances of noncompliance with requirements and good practices. This approach left managers with overwhelming catalogues of deficiencies, but little sense of priorities.

In the new Office of Environment, Safety and Health, all oversight appraisals will be managed by a single office headed by a Deputy Assistant Secretary reporting directly to me. Appraisals will be conducted according to disciplined protocols, by trained assessors, with validated information and with a timely report as an end product. Rather than lists of what's wrong, these appraisals are aimed at providing information needed by program managers to develop corrective actions and prioritize resources. Based on on-going analyses of site specific performance measures, we will deploy scheduled assessments by multidisciplinary teams. Site residents, environment, safety and health specialists who are stationed in the field at specific facilities, act as our "eyes and ears" at major facilities, providing a continuous, day-to-day presence.

The product of the six comprehensive site assessments we intend to conduct in FY '96 will be concise reports of the efficacy and comprehensiveness of a site's management systems for assuring protection of the environment and worker and public health and safety. We will primarily evaluate the performance of DOE management systems at Headquarters programs and Field Offices; we will also sample contractor performance for validation purposes. We will conduct four safeguard and security audits, and five special reviews of issues such as radiation protection that crosscut programs and facilities. The Office of Environment, Safety and Health is also the office responsible for investigating the causes of fatalities and serious accidents.

It is our hope and expectation that focused and validated evaluations of line management performance will promote effectiveness and consistency among DOE sites and ensure that safety considerations are given appropriate attention. Oversight properly done should provide useful roadmaps of vulnerabilities and performance trends, and should help identify early indications of problems before they become serious.

LEVERAGING EXPERTISE TO PROTECT WORKERS AND THE PUBLIC

As I mentioned earlier, the Office of Environment, Safety and Health houses the Department's technical expertise in the full range of environmental, safety and health professions. To meet our commitment to the thousands of workers and make DOE operations safer, we recognize that we will need to take full advantage of these resources -- both in our own organization and in the various DOE programs. Our office needs to be a "corporate resource" leveraged throughout the Department to help federal program managers formulate workable actions and solutions.

The Office of Worker Health and Safety

The intiatives underway in this office provide DOE managers with important tools for implementing sound worker protection programs such as "hands-on" technical assistance and guidance by seasoned professionals, model programs that display the "best practices" found throughout DOE and in private industry, and linkages to trade organizations and industry groups such as the Center for Chemical Process Safety.

On-site mentoring. The Office of Environment, Safety and Health established a mentoring program in 1993 to help improve safety and health performance at the Hanford High-Level Waste Tank Farms following a series of operational events that indicated pervasive problems in both management and conduct of operations. In this program, environment, safety and health experts from DOE Headquarters are paired with managers, supervisors or employees in the field. Based on sustained and measurable success at the tank farms, the program was expanded to provide additional assistance to other Hanford facilities. FY 96 mentoring activities will be conducted at Idaho, Oak Ridge, Pantex, Fernald and Savannah River.

The Hanford mentoring program not only delivered significant, quantifiable improvements in safety and health performance (a 56 percent improvement over one year); it has already saved millions of dollars by identifying innovations and improvements. For example, Hanford mentors proposed changes to core sampling systems at the high level waste tanks that will allow the samplers to be decontaminted and reused, resulting in cost savings of between $750,000 and $1.25 million. Radiation protection mentors helped analyze radioactivity monitoring requirements and were able to eliminate numerous sample points, saving another $350,000. We fully expect that this level of savings will be duplicated at each site.

Model programs. As an alternative to the "command and control" approach of the past, the Office of Environment, Safety and Health partners with workers to develop effective and practical ways to address requirements and solve problems. For example, we are working with our cleanup contractors to model the most effective practices in use so that the best techniques and guidance can be made available across DOE. Training criteria being developed for hazardous waste cleanup workers, that is better preparing them for the hazards they will face, is estimated to save tens of millions of dollars when issued by the end of the year. Another model program is our construction safety guidance, developed collaboratively with construction firms and workers, and has already been hailed as a national model.

Hazardous Waste Cleanup Workers. In partnership with the Office of Environmental Management, we have initiated a program aimed specifically at protecting workers involved in hazardous waste activities at DOE sites. The goal is to clarify application of worker safety and health standards at cleanup sites to assure their effectiveness, improve efficiencies, and save money. Effective industry programs are modelled and then field tested in pilot applications. Facing complex technical challenges and uncertainties, we are teaming resources and drawing on industry experience to create an integrated, comprehensive and standards-based worker health and safety protection program.

Exposure Assessment. A process that identifies, evaluates, and acts upon workplace hazards is essential to effective work planning. The root cause of most fatalities and serious injuries at DOE sites has been identified as inadequate safety considerations in work planning. To address this generic weakness, we have in place collaborative efforts at several DOE sites to develop approaches that will demonstrate how supervisors, workers, and safety and health professionals can more efficiently and effectively plan work and increase safety. Pilots are underway at Hanford and Rocky Flats, and we expect to announce a third site shortly. These pilots have been particularly successful in enlisting active participation of workers.

Benchmarking industry practice. Under an agreement with the Chemical Manufacturers Association, managers at our Rocky Flats site partner with private companies to learn management approaches that work for safety and save money. Through our Voluntary Protection Program (VPP), a dozen DOE operating contractors and laboratories voluntarily work with industry leaders such as AT&T, Mobil, Dow and Monsanto to attain accident prevention programs on par with the best in this country. Similar VPP programs in industry have demonstrated progressively lower accident rates and considerable cost-savings among participants. On average, VPP participant companies have 63 percent fewer injuries and illnesses than non-participants.

The collection and tracking of workers' compensation data has become a standard management tool in industry to focus attention on the cost of and need to prevent occupational illness and injury. By the end of this year, we will collect, track and evaluate workmen's compensation data from across the Department as a means of holding managers accountable for reducing accidents and injuries.

We have begun to see some of our efforts focused on accident and illness prevention at DOE facilities pay off. Over the last four years, DOE has recorded a steady decline in recordable accident rates: our overall accident rate has decreased by eight percent and our rate of serious accidents (lost workday rate) has declined 30 percent from 58.7 in 1991 to 41.1 in 1994. Our onsite assistance at the Hanford PUREX deactivation project contributed to a safety record of recordable injury and illness that is more than 40 percent better than the DOE average.

The Office of Nuclear and Facility Safety

The Office of Nuclear and Facility Safety carries out an integrated program that involves analysis of facility operations, assistance to program managers responsible for nuclear safety assurance programs, and the development of policies and standards.

Vulnerability Assessments. Led by the Office of Nuclear and Facility Safety, DOE completed over the last 18 months two "vulnerability" assessments examining plutonium and spent fuel at DOE sites that, along with a third study on hazardous chemicals, present a vivid snapshot of the hazards and challenges faced by DOE and its workers. Before these studies, DOE management knew of recurring incidents in these areas, but had no clear path that described exactly where or how serious the hazards were. These studies are not sitting idly on bookshelves in DOE libraries. They have dramatized safety and health concerns for a number of audiences, and, most critically, they have acted as road maps driving management decisions and have been instrumental in redirecting attention and resources toward the most urgent risks.

Each vulnerability study has been accompanied by a management action plan put together by the program offices that maps out a site-by-site strategy to eliminate existing vulnerabilities and prevent their recurrence. We are now working with the responsible program managers to implement these corrective action plans which span several years. We will begin a fourth vulnerability study on highly-enriched uranium later this year.

Special Studies. The highly-skilled engineers in the nuclear safety office work with program managers to provide solutions to health and safety problems. Their independence from mision functions provides an objective view that best protects the safety and health of workers and the public. For example, the Office of Defense Programs requested our assistance in evaluating the new $2 billion Defense Waste Processing Facility that will be used to vitrify high level waste at the Savannah River site. Our engineers found that neither the project's underlying safety analysis nor its facility design provided adequate protection for seismic events and the facility, if built as planned, would not have met DOE requirements. By focusing on the problem well before startup, line managers were able to identify the most cost-effective solutions.

We also work with headquarters program management on major new nuclear projects to assure that safety criteria are considered from the beginning. Last month, our engineers assisted with the new spent fuel nuclear fuel processing facility that will be constructed at Hanford -- one of the top vulnerabilities identified in the spent fuel study mentioned earlier. And last month, we participated in a special management review of the plutonium facility identified as "the most vulnerable" in our plutonium study -- Building 771 at Rocky Flats.

Operational Analysis. The Office of Nuclear and Facility Safety also examines all operating events or accidents in both the DOE complex and the commercial nuclear industry to analyze them for root cause and lessons learned that are then communicated throughout the DOE complex. In one case, a worker was nearly electrocuted in South Carolina due to a faulty 450-volt electrical breaker repair kit provided by the manufacturer. As a result of the lessons learned, work to install the kit at another site was cancelled potentially avoiding another serious accident.

Transition to a Coherent, Standards-Based Safety Culture. The Office of Nuclear and Facility Safety is leading a DOE-wide effort to streamline and consolidate orders by eliminating redundancies, conflicts, and unnecessary requirements. We expect that this project will reduce the 50 current environment, safety and health orders to less than 20, achieving more than a 75 percent reduction in overall requirements.

The nuclear safety office also staffs a DOE-wide standards program that is moving the Department toward a standards-based culture. As DOE has evolved from the Atomic Energy Commission and the need to protect national security, it has relied upon "expert-based" culture for nuclear safety. This approach compartmentalized our nuclear facilities so that each used a unique approach based on its best technical judgment. Such an approach does not allow the consistency needed for effective management control and assurnce that operations are being conducted safely. Standards, as they exist in the private sector, define what it takes to work safely on specific operations and identify procedures that ensure safety. FY '96 activities will include a continuation of the standards development process along with workshops to communicate the new standards to DOE program and field offices.

Another key activity of the nuclear safety office is the Department's implementation of the Price-Anderson Act Amendments of 1988 that authorized DOE to impose civil penalties for violations of nuclear safety requirements. Two rules have been issued and the remaining top priority rules (so-called Phase I rules) are in final review. Phase II rules are currently scheduled to be issued for public notice and comment by September 1995 with final publication in the end of 1996. These rules will be important tools for holding DOE contractors accountable for good safety practices and are an important part of our overall effort to instill the accountability and managerial effectiveness found in the best private sector businesses.

THE OFFICE OF HEALTH STUDIES

The single program area for which we are proposing a budget increase this year is for our Office of Health Studies. The Office of Health Studies sponsors domestic and international studies to increase our understanding of the radiation health effects and the environmental and occupational health impacts of DOE operations. Investigations of the relationships between exposures to radiation and chemicals and consequent health effects among populations is a critical public health function that is key to designing effective strategies. This budget request reflects our commitment to promote and to protect the health of all DOE workers as well as the health of the communities that have hosted our sites throughout more than forty years of nuclear weapons production.

Medical Surveillance. We are working with various stakeholder groups to design an effective program that would address the health needs of former workers, as mandated by the 1993 Defense Act. Our objective is to put together a monitoring program that is both scientifically credible and cost-effective. As the statute requires, we have negotiated a memorandum of understanding with the Department of Health and Human Services, and we have invited participation of the National Academy of Sciences, the National Council on Radiation Protection, and the American College of Occupational and Environmental Medicine. We are planning to involve experts and other stakeholders in a facilitated process to critique and discuss a strawman proposal for a monitoring program that we will develop over the next several months.

This is both a complicated and controversial task. Whatever the final program, the issue of medical surveillance of former and current workers is likely to have dramatic budgetary consequences in the coming years.

State-Sponsored Health Studies. Through State Health Agreements entered into by previous Administrations, we provide grants to states hosting DOE facilities to determine the impact of operations of these facilities on the health of the surrounding communities. California, Colorado, Florida, Idaho, New Mexico, South Carolina and Tennessee have received grants through this program. Funded projects include epidemiologic studies that follow patterns of disease occurrence in populations and the factors that influence these patterns, environmental dose reconstruction studies that estimate the radiation doses received by populations based on environmental data, and the development of tumor and birth defects registries that record individual disease occurrences to provide the data necessary to draw conclusions about the health of a population. All grant applications are reviewed by peer experts external to the DOE. To date, nearly $40 million has been devoted to these studies.

Worker Studies. The Epidemiologic Surveillance Program tracks illnesses and injuries among workers at DOE sites. Approximately 65,000 workers at ten DOE sites are currently involved: Brookhaven National Laboratory, Fernald Environmental Management Project, Hanford, Idaho National Engineering Laboratory, Pantex Plant, Rocky Flats Plant, Sandia National Laboratory, and Savannah River Site. Data analysis determines rates of illness and injury among the current workforce to identify the workplace conditions that may pose a health threat. Surveillance data are shared with workers, occupational physicians, labor unions, DOE management and other government officials. The reports are in DOE public reading rooms and soon will be electronically accessible through the Internet.

To fulfill our responsibility for determining human health effects associated with working at or living near DOE facilities, DOE has established an external epidemiology program through a Memorandum of Understanding with the Department of Health and Human Services and its Center for Disease Control and Prevention. Current projects include epidemiologic studies of employees, environmental dose reconstruction projects and studies of childhood cancer in communities near DOE sites.

International Radiation Effects Studies. Our international health studies program focuses on collaborative government-to-government research efforts with other nations. The largest single item in our overall budget is funding for the Radiation Effects Research Foundation, the organization that conducts long-term research on the health effects of the bombing of Hiroshima and Nagasaki. The private, nonprofit Japanese foundation was established in 1975 and is supported equally by the Government of Japan and the Government of the United States. These studies have provided the principal basis for all current international radiation health standards that set limits to exposure levels in a wide range of occupational and clinical settings. Life-span studies of atomic bomb survivors and their children have formed the foundation of our currently knowledge of the cancer and non-cancer health risks from radiation exposure.

In 1988, the U.S. and the former Soviet Union initiated collaborative studies on radiation exposure health effects from the Chernobyl nuclear reactor accident of April 1986. Studies are focused on the health and environmental consequences of the accident in the regions of Ukraine. Belarus, and Russia.

In January 1994, the United States and the Russian Federation signed an agreement to conduct a joint research program on the health and environmental effects of radiation. This program is likely to fill in critical gaps in our understanding of the risks associated with radiation exposure, and will be directly applicable to the thousands of workers who will be engaged in environmental cleanup at nuclear facilities in the United States.

Initial research will focus on community and worker population studies near a former weapons production facility in the Chelyabinsk region, one of the world's most significantly contaminated areas. This data will provide an important opportunity to determine the risks associated with chronic low-level exposures to radiation and to compare it to risk estimates previously obtained from populations acutely exposed to radiation.

THE OFFICE OF ENVIRONMENT

NEPA Policy and Assistance. Compliance with the National Environmental Policy Act (NEPA) is a prerequisite to nearly all of the Department's programs and projects, Our NEPA office supports the full range of the Department's proposed actions by assuring timely and adequate compliance with these requirements. Failure to comply with NEPA, or inadequate planning of NEPA reviews, results in delays or litigation that can cost millions of dollars for major projects.

In 1994, our office led the Department-wide reform of the NEPA process so that it now works better, costs less, and is more useful to decisionmakers and the public. We are now beginning to reap the benefits of those improvements in that the average time for NEPA document preparation is decreasing. One recent success story is the Environmental Impact Statement for the resumption of operations in F-Canyon at Savannah River. Once the decision was made to proceed with this NEPA review, the process was completed in 10 months, enabling the Department to take timely action to address plutonium storage safety concerns. In another recent case, known as Project Sapphire, the NEPA office supported preparation of an accelerated classified environmental assessment, enabling the receipt of highly-enriched uranium from Kazahkstan and thereby addressing a significant non-proliferation concern. We are now focusing our efforts on developing ways to control the costs of NEPA compliance. We are carefully tracking the Department's NEPA costs and disseminating cost-saving lessons learned throughout the DOE complex.

FY 1996 activities are expected to include planning and assistance for a significant number of major NEPA actions, including about 50 environmental impact statements, 100 related NEPA documents, and 1,000 other NEPA-related actions. For example, the NEPA office will support four highly complex programmatic environmental impact statements (Waste Management, Tritium Supply and Recycling, Stockpile Stewardship and Management, and Weapons-Usable Fissile Materials Storage and Disposition) and five or six multi-purpose site-wide EISs. Several other major EISs, such as the high-level radioactive waste geologic repository EIS and the Waste Isolation Pilot Plant Supplemental EIS, will be initiated to support decision making in these critical areas.

The NEPA office will also continue to provide policy, guidance and technical assistance to the DOE programs and will continue development and use of training materials to improve efficiency and ensure adequacy and consistency of NEPA reviews.

Environmental Policy and Assistance. The purpose of this program is to develop Department-wide environmental protection strategies that will protect the public and the environment and attain environmental compliance with both internal and external laws. While we expect that the movement toward external regulation will continue, the statutes and consequent implementing regulations are primarily developed based on private industry experience, without regard of the Department's unique radioactive components. The Policy and Assistance office acts as DOE's coordinator for emerging federal regulations -- soliciting DOE-wide comments, developing Department positions, and advocating these positions with the regulators. The Office monitors more than 300 emerging regulations that may affect the Department's operations, and advocates positions on more than 40 rulemakings per year. By bringing potential problems to the attention of the regulators before they are implemented, significant cost savings and non-compliance situations are avoided. The program's technical experts also assists the Department's program and field offices understand and implement environmental requirements and averting oncoming environmental compliance problems.

To conclude, Mr. Chairman, I recognize the extreme challenges faced by you and your colleagues in trying to meet spending limits for Fiscal Year '96 in the face of compelling and competing priorities. I do, however, urge you to view the budget for the Office of Environment, Safety and Health not as a one-time outlay of federal funds, but as an investment that will pay off to the taxpayer -- in terms of lives saved, illnesses and injuries prevented, lower worker compensation claims, and avoided costs of defending the government and its contractors against lawsuite. And in view of the hazards that pose serious and immediate threats to worker and public health and safety throughout the DOE complex, the time to make that investment is now.

Mr. Chairman and Members of the Subcommittee, that concludes my prepared remarks. I would be happy to answer any questions.

THURSDAY, MARCH 9, 1995.

DEPARTMENT OF ENERGY GENERAL SCIENCE, BIOLOGICAL AND ENVIRONMENTAL RESEARCH, BASIC ENERGY SCIENCES

WITNESS

DR. MARTHA A. KREBS, DIRECTOR, OFFICE OF ENERGY RESEARCH

Mr. MYERS. The committee will come to order. This morning we are pleased to have Dr. Krebs with us once again, a very important role that we are going to talk about the basic sciences and how we are going to move into the next century. Your prepared statement will be a part of the record. You may proceed as you care.

ENERGY RESEARCH PROGRAMS

Dr. KREBS. Thank you, Mr. Chairman. Chairman Myers, Mr. Bevill, it is a pleasure to be here again. I am proud to be part of the basic research programs in the Department of Energy. I am proud of the results that these programs have had and of the people at the Department, at the laboratories, and at the universities who actually make these programs happen.

At DOE and the Office of Energy Research we are trying to work smarter and more cost-effectively. We look forward to supporting the Department's effort to respond to the Galvin report and reduce unnecessary costs at the laboratories. In 1996 the ER budget is somewhat increased, but basically still sparse, and committed to utilizing our unique scientific facilities that only DOE contributes to the Nation's basic research effort.

The Office of Energy Research is basically about providing the fundamental knowledge and skill base that is necessary for the DOE to pursue its energy and environmental missions. Through our national labs, we provide a critical physical and human infrastructure for the national investment in basic research. We do our work by working with our colleagues in the DOE's energy technology programs and in industry to identify critical roadblock problems for the energy and environmental missions.

We work with our colleagues in the labs and in universities to identify where frontier knowledge and unique instrumentation can make a difference in solving those problems. We work with our colleagues in other agencies to leverage their work on behalf of the energy and environmental missions so that they can leverage our work on behalf of their missions, basically minimizing duplication, and working on all of the hard science and technology problems that the Nation has.

We think we make a difference. That is what that one board is supposed to convey. We support unique areas of materials and chemical sciences. We use frontier biology to understand the health and environmental effects of energy production and use and how to clean up the environment. We support 90 percent of the Nation's effort in high energy and nuclear physics. We use external peer review to guarantee the highest quality of research. Now the question is what have we done for you lately.

Mr. MYERS. Or done to us.

Dr. KREBS. You do to us. We have had to do for you.

Mr. BEVILL. She seems to know us better than we thought she did.

Dr. KREBS. As you can tell, I enjoyed show and tell in grade school, so I can't come up here without something to show you. Within the Basic Energy Sciences program we have been working on a field called nonimaging optics, and the most visual kind of use of that is in this Thunderbird taillight which I got from Dr. Decker because he drives a Thunderbird.

DIFFUSE LIGHTING

Basically what happens in this taillight is there is an LED. Usually in taillights you use little bulbs like this, 15, 20-watt bulbs. We have an LED, that uses fractions of a watt, and you have something called nonimaging optics that basically focuses and directs a tiny amount of light so it fills up this whole space and is very bright to anyone who is following the car. This concept of nonimaging optics was developed by a high energy physicist who was trying to make high energy particle detectors better by gathering the light from all the particles that came out of the different interactions.

The Basic Energy Sciences program picked it up and said, well, if we can use this concept for gathering light from elementary particles, then perhaps we have another diffuse source; namely, the sun, and we can use that to gather as much of that light as possible, and, in fact, this whole concept is also in use now that we have developed it at a solar furnace at the National Renewables Lab, but in addition, somebody, I don't know where it was, whether it was in the auto industry or at Hewlett–Packard also said, well, gosh, if we can use this concept to gather diffuse light, maybe with very small energy efficient light emitting diodes we can use this concept to throw it and focus it, and that is what led to this application.

More recently, somebody in the computer industry has decided that we can also use this for back lighting of flat panel displays for lap tops, and say if basically half the power that is associated with illuminating these kinds of devices and your battery will last 20 percent longer. I don't know whether you use a lap top, but if you do and you run out of power in the airplane, you are never very happy, so these are the kinds of things that we are doing.

HUMAN GENOME

In addition to these sorts of things, of course, we have been investing for the last few years in the Human Genome program, and, obviously, we do that because we are interested in the health and environmental effects of energy use and production, but we have a capability in our laboratories and in the universities, and they have been integral parts of the team in the last year, year and a half that have discovered the breast cancer gene that is associated with some 180,000 cases of breast cancer a year.

We have also worked to identify the DNA repair gene that looks like it may be responsible for up to 15,000 cases of colon cancer every year. Within the Fusion Program we have seen a phenomenal campaign over the last year to increase the fusion power performance of the Tokamak Fusion Test Reactor at Princeton, and those results have exceeded our expectations, as a result of that institution, and the fusion community generally, developing an extraordinarily exquisite set of instrumentation that allows us to both tweak and control and see what is happening in these high temperature, high density plasmas. Then, of course, last week we announced at Fermilab, as a result of the Collider Detector Facility, that is what is in the left hand picture, we announced the confirmation of the discovery of the top quark, and that is a discovery that is a testimony, I think, to our ingenuity as a species, and is extraordinarily satisfying at an intellectual level.

And if you ask me what it is for, I can't tell you yet, but what I can tell you is 90 years ago we didn't know about protons, and now we treat cancer with them, and perhaps, you know, our great, great grandchildren, if they live in a free and open society, may be thinking about what they can do with quarks. I don't know. It is not a prediction. Anyway, before I let you have at me.

Mr. MYERS. She does know us, Tom.

Dr. KREBS. Let me share a recent statement from Dr. Glenn Seaborg. As you know, he is a Nobel Prize winner and former Chairman of the Atomic Energy Commission, and I had the great privilege to know him when I was at the Lawrence Berkeley Lab. He is a wonderful human being, a fine scientist and a very accomplished citizen, and he said,

> I sometimes liken the role of the scientist to that of a mountain climber, who with great care and exertion achieves some great prominence from which he is able to perceive immediately and clearly new vistas which are hidden from the sight of those down below in the valley, even though many of those in the valley may have better eyesight.

In the Office of Energy Research we try to find the hills that scientists can climb and help support them. We come to this hill because you may have better eyesight. We need that eyesight.

Mr. MYERS. You have concluded at this time?

Dr. KREBS. I am ready for questions.

[The prepared statement of Dr. Krebs follows:]

Statement of Martha A. Krebs,
Director, Office of Energy Research
Department of Energy
FY 1996 Appropriations Hearings

Mr. Chairman and Members of the Subcommittee:

I am pleased to be here today to present the Fiscal Year (FY) 1996 budget request for the programs supported by the Office of Energy Research. These programs are: Basic Energy Sciences, Fusion Energy, Biological and Environmental Research, High Energy Physics, Nuclear Physics, Laboratory Technology Transfer, Energy Research Analyses, Multiprogram Energy Laboratories-Facilities Support, and supporting program direction. Before going into the specifics of our request for these programs, I want to provide a broader national context for the work that we do.

Our Perspective

Over the past two decades, there has been a steady change in how technological developments are introduced into the national economy. Not very long ago, they evolved with little relationship to their environmental implications. It was enough that they worked. Today we take a more integrated approach. Technology development is linked to the environmental considerations that are altering the very way in which we do business as a Nation. From auto emissions and greenhouse gases to clean water and radioactive waste cleanup, we, as a Nation, have become increasingly sensitive to the economic and environmental implications of what we do technologically. By stressing the interrelationship of the economy, the environment, and technology, we ensure a more rapid industrial development cycle because what we develop is then more likely to be environmentally benign and widely accepted. One of the main missions of the Office of Energy Research is to conduct programs which provide the science that triggers and drives such appropriate technological development. We carry out this mission through programs focused on basic research that provide the foundation for technical advancement and through partnerships with universities, national laboratories, and industries across the Nation. And we emphasize research that: maintains our world leadership in science, math, and engineering; supports the Department's energy and environmental missions; and promotes technology transfer through partnerships with industry.

The programs of the Office of Energy Research span five focus areas, namely:

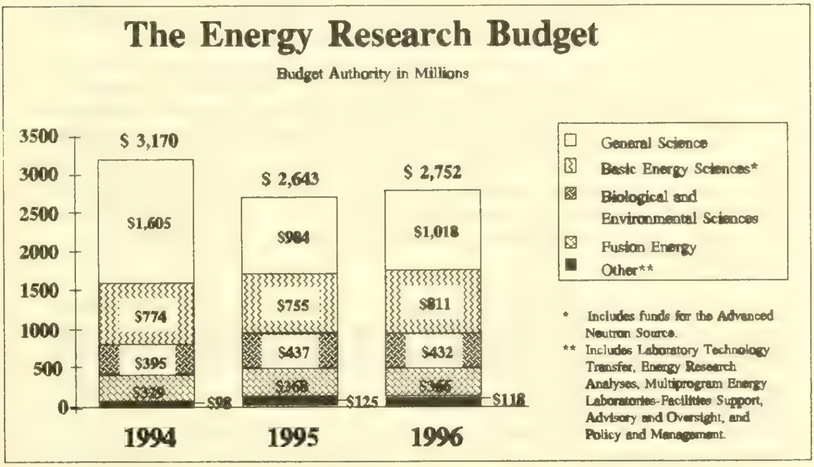
- **Knowledge and Skills for the Department's Energy and Environmental Business Lines** which also have much broader implications for the Nation's technology competitiveness. The Office of Energy Research programs in Basic Energy Sciences, Biological and Environmental Research, and Fusion Energy are in this area.

- **Fundamental Research in Energy and Matter** that advances knowledge for future technologies and helps maintain U.S. world leadership in science. The High Energy and Nuclear Physics programs are clearly in this category.

- **Construction and Operation of Major Experiments and User Facilities** to produce advanced research tools needed for forefront research. They include accelerators for high energy and nuclear physics research, neutron sources, magnetic fusion facilities, and synchrotron light sources.

- **Technology Research** in partnership with industry that addresses industry-driven economic opportunities while supporting the Department's missions. Our Laboratory Technology Transfer program, Cooperative Research and Development Agreements (CRADAs), and other partnership arrangements with industry and with the Department's technology programs make up this category.

- **Education** activities that provide high-quality, timely, scientific and technical information services and education assistance to a wide range of customers to enable the Department to contribute to the welfare of the Nation. The Office of Energy Research conducts a number of science education-related programs which are inherent in our research programs. These efforts include support for nationally competitive graduate and postdoctoral research fellowships, direct funding of universities, and the provision of scientific user facilities where professors and students conduct their experiments.



The Energy Research Budget

Budget Authority in Millions

* Includes funds for the Advanced Neutron Source.

** Includes Laboratory Technology Transfer, Energy Research Analyses, Multiprogram Energy Laboratories-Facilities Support, Advisory and Oversight, and Policy and Management.

Implementing Our Programs

In large measure, the Office of Energy Research's programs are carried out at universities and national laboratories. The Office has a special role in ensuring the vitality and responsiveness of these institutions. Our interest and commitment to universities is tied to their responsibilities for the next generation of scientists and engineers. They bring the best and the brightest to bear on the Department's programs and make the creative enthusiasm of youth available to investigate and solve national problems.

The national laboratories, with their multidisciplinary scientific teams, carry out large-scale coordinated research for the Department in such areas as global climate change, energy conversion, advanced materials, human genome, high energy and nuclear physics, and others. They have made major contributions in the past -- among them the definition and early development of the entire field of nuclear medicine and almost as broad an influence on large scale, high speed computing and interactive computing -- and are viewed as a special resource for the future. The basic science investment in unique facilities and scientific teams at the laboratories enables them to address the broad cross-disciplinary problems of interest to industry and the Nation.

Science Facilities Initiative

The Department of Energy operates many large, state-of-the-art basic research facilities used for specialized energy, environmental, medical, genome, physics and industrial research. Such facilities include high energy and nuclear physics accelerators, neutron and synchrotron light sources, supercomputer centers, and smaller facilities such as electron microscopy centers. I am particularly proud of this aspect of our program for it not only sets us apart from the other Federal agencies that support science, it ensures that our Nation will maintain its world leadership across a multitude of scientific disciplines. I am committed to supporting the best scientists in the world at our first-rate facilities, to managing these facilities in an efficient, cost-effective way consistent with all matters of environmental compliance, and to measure ourselves continuously, as we have in the past, by peer review of our product and our performance.

About 15,000 industry, university and government-sponsored scientists conduct unique, cutting-edge experiments at the Department's basic research facilities each year. The light sources alone are used by about 4,000 researchers annually for basic research in such important areas as polymers, alloys, semiconductors, superconductors, magnetic materials, structural biology, and pharmaceuticals. In many of these research areas, U.S. industry relies heavily upon the Department's facilities to conduct experiments that would otherwise be too expensive, or even impossible, to carry out in the United States. The demand for operating time at our basic research facilities has increased dramatically and in most cases has exceeded availability by a factor of two to three.

Funding limitations have restricted operating time at these facilities and have prevented us from meeting the increased demand. As a result, most of the Department's research facilities are currently underutilized.

The FY 1996 budget recognizes the importance of these facilities and the need to reverse these trends by supporting a $100 million Science Facilities Initiative ($60 million in Basic Energy Sciences, $25 million in Nuclear Physics, and $15 million in High Energy Physics). Approximately 20 percent of Initiative funds will be provided directly to user groups through competitively awarded grants. This Initiative, affecting 23 user facilities nationwide, will increase the number of users at many of our facilities by about 30 percent and will make good, in part, on the President's commitment, articulated in Science in the National Interest, to make investment in science and its infrastructure a top priority.

Renewing High Energy and Nuclear Physics

As the Subcommittee knows, the Department of Energy is the primary funder of high energy and nuclear physics in the country. Part of this is historical, related to the origins of these programs in the Atomic Energy Commission, but most of it is related today to the fact that the Department is the world's acknowledged leader in this forefront area of physics, and in the design, construction, and operation of the kinds of facilities that are needed to pursue this research. In particular, scientists supported by our High Energy Physics program in the past year have obtained experimental evidence for the existence of the "top quark," providing verification of the Standard Model, a greatly simplified picture of the physical world at its most fundamental level.

Budget Authority in Millions

General Science & Research	FY 1994	FY 1995	FY 1996 Request
High Energy Physics			
- Operating Expenses	463.8	474.7	494.8
- Capital Equipment	60.1	57.7	63.2
- Construction	86.3	109.7	127.6
Total High Energy Physics	610.2	642.1	685.6
Nuclear Physics	345.3	331.5	321.1
Superconducting Super Collider	640.0	0.0	0.0
General Science Program Direction	9.0	10.4	10.9

Continuing U.S. leadership of this sort over the next several decades will require continued investment in national and international research. On the domestic front, the Department is providing a funding increase that reflects the recommendation of the High Energy Physics Advisory Panel. This increase, planned for a three-year period beginning in FY 1996, will permit an approximately 30 percent increase in operating time at high energy physics facilities compared to FY 1995 levels. It is clear that research user facilities are currently underutilized, primarily because of budget stringencies and the necessity to balance funding between facility operations and research. It will also allow the Department to complete both the Fermi National Accelerator Laboratory (Fermilab) Main Injector and the Stanford Linear Accelerator Center (SLAC) B-factory upgrades, thus maintaining these laboratories as world-class facilities. On the international front, the Department is considering a U.S. commitment to cooperation with European physicists on the proposed Large Hadron Collider at the CERN Laboratory in Switzerland. Cooperation on the Large Hadron Collider will ensure that U.S. researchers have access to new scientific regimes after the turn of the century.

In the nuclear physics program, construction will continue at Brookhaven National Laboratory on the Relativistic Heavy Ion Collider, while the Continuous Electron Beam Accelerator Facility (CEBAF) in Newport News, Virginia, will begin full-scale operation in FY 1996. Designed to probe the quark structure of matter, CEBAF is already generating intense interest from the scientific community. Users from a community of one thousand scientists in 200 research institutions have already scheduled the first three years of experimental time on the machine.

Fundamental Knowledge and Skills for Energy and the Environment

Basic Energy Sciences and the Environment

The Basic Energy Sciences program and the Environmental component of our Biological and Environmental Research Program have also contributed significantly to the Department's mission over the past year by finding new and improved ways to conserve resources, control pollution, reduce waste in manufacturing processes, understand and predict the impacts of global climate change, and develop innovative approaches to waste cleanup.

The following are just a few of the noteworthy accomplishments which demonstrate the impact of these programs; they are representative of the type of research that will benefit from the Science Facilities Initiative.

- Scientists at the Department's Ames Laboratory have developed a lead-free solder having substantial environmental benefits. The discovery of the new solder alloy, based on tin, silver, and copper, eliminates the hazard of exposure to lead-containing vapor in industrial soldering. Johnson Manufacturing, Inc., of Princeton, Iowa, an ingot and wire manufacturer for the electronics industry, recently licensed the Ames lead-free solder technology. Performance tests indicate the new material forms strong joints suitable for major electronic circuit manufacturing operations such as those used by the automobile industry.

- Years of research into the theory of alloys, supported by the Department, paid off again in 1994, when scientists at the California Institute of Technology discovered a new set of metallic glasses that could be produced in "ingot" sizes. Metals with glass-like properties have always been known to have corrosion resistance superior to other, more conventional, metallic structures, with reduced friction and improved wear, but could never be produced in bulk. This development offers a more economical way to produce complex metallic shapes with little waste using manufacturing practices such as near-net-shape forming and injection molding. Commercial applications range from corrosion-resistant car parts to high-precision components for airplanes.

- It will soon be easier to rid groundwater and mixed waste streams of toxic metals such as cadmium, mercury, and lead by passing the contaminated liquids through a new resin discovered at Argonne National Laboratory. The resin exchanges harmless substances for the heavy metals. Dubbed "Diphonix," the resin is a versatile polymer with a broad range of capabilities that also exhibits a marked affinity for radioactive metal ions. A company established in 1990, ElChroM Industries, Inc., is commercializing the resin for a variety of cleanup applications.

- Advances in "massively parallel" supercomputing have enabled scientists to better simulate climate change. Researchers at the Los Alamos National Laboratory, the National Center for Atmospheric Research, and the Naval Postgraduate School are completing development of the first integrated model that couples ocean circulation to state-of-the-science atmospheric models, providing real confidence for the first time that accurate climate change predictions are possible. In addition, we have deployed the first Atmospheric Radiation Measurement (ARM) site, the first of three such sites planned for deployment by 1997 that will make possible the systematic compilation of a reliable global climate data base.

Improving Our Health

Progress in biotechnology translates into more products and processes of potential economic and social benefit to the Nation than probably any other scientific discipline. The Department sponsors an active program of such research that traces its origins back to the mid-1940's when legislation directed the Atomic Energy Commission to explore the utilization of radioactive materials for medical and health purposes.

Beginning in the 1970's, legislation empowered the Department and its predecessor agencies to support environmental, physical, and safety research related to the development of energy resources and their utilization. As a result of implementing these legislative mandates, the Department, through the Office of Energy Research, has established and maintained a world leadership role in these areas of science. As partial evidence, I offer the Subcommittee the following examples:

- Our scientists at Pacific Northwest Laboratory have successfully mimicked the bond between living bone and medical implant materials, such as titanium and metal alloys, and as a result, developed coatings that have increased the interlocking between the implant surface and growing bone. Current implant materials may fail after only a few years of use; the new coatings are expected to last significantly longer. If so, they would not only reduce the cost of producing medical implants, a $100 million dollar per year industry, they would also improve the quality of health care. An estimated 500,000 patients receive hip implants and knee replacements each year in the United States.

- Scientists at Lawrence Berkeley Laboratory have demonstrated the importance of a cell's microenvironment on the development of normal breast tissue and breast cancer. This research has led to the development of a rapid cell culture assay to distinguish normal human breast cells from their malignant counterparts.

- Human Genome program resources and technologies are speeding the discovery, characterization, and isolation of disease genes. For example, Department of Energy-funded research at Brookhaven National Laboratory, the Eleanor Roosevelt Institute for Cancer Research, and the California Institute of Technology had direct roles in the recent isolation of a DNA repair gene that may be responsible for up to fifteen percent of all colon cancers and another gene, BRCA-1, that contributes to susceptibility to breast cancer in some women.

- Microbial genome research utilizes technologies, developed in the human genome program, to characterize and engineer the genome of microorganisms to treat and minimize process wastes from key industries. The structural biology program, in conjunction with the genome studies and the computational biology program, contributes the resources and technology to reengineer important biomolecules for use in waste remediation, environmental cleanup, drug development, and industrial catalysis.

- Scientists performing medical applications research continue to advance the development of new radiopharmaceuticals through programs that design, synthesize, and label biologically active molecules. These molecules serve as medical probes for imaging by such diagnostic systems as Positron Emission

Tomography (PET) and Single Photon Emission Computerized Tomography (SPECT), thereby helping to diagnose disorders and monitor effectiveness of a wide variety of treatment protocols. For example, research sponsored at the University of Michigan has yielded a radiopharmaceutical, approved by the U.S. Food and Drug Administration, for diagnosis and treatment of neuroblastoma, a deadly type of cancer in children. Technology which has evolved from the Department's nuclear medicine program is now being used in more than 100 million diagnostic and therapeutic procedures performed annually.

Harnessing Information Technology

Research at our laboratories on advanced computing and advanced mathematical techniques led to the development of today's supercomputers and spawned a major new industry which has penetrated most major U.S. industrial sectors. High performance computing and communications are important parts of the Administration's effort to promote the development and use of the national information infrastructure. Significant achievements in the past two years include the development of innovative software that reduces automobile crash test analyses from one month to one day and the "parallel virtual machine" concept that links hundreds of workstations together in an efficient problem-solving environment that has been adopted by industry to attack otherwise intractable computational problems. In addition, the award to U.S. Sprint of a $25 million contract from the Department's Lawrence Livermore National Laboratory helped demonstrate a new communications technology that enables a dramatic increase in the ability of a network to transfer the massive amounts of data that characterize many of today's multimedia computer applications. It is reported that Sprint is prepared to invest $500 million in this technology, speeding up by two years the industry timetable for reducing it to commercial practice.

The FY 1996 program promotes the integration of these and other successes with communication protocols, languages, and other tools to produce a totally new research environment, one that allows geographically distributed investigators to interact with remote facilities as a seamless part of their working world, and one that allows "virtual laboratories" for more effective operation as recommended by the Galvin Commission report findings. These developments will eventually transform science education by linking every classroom around the country to libraries, databases, museums, and even to our national laboratories so that students and teachers can participate in real time on real experiments with working researchers.

Future Neutron Sources

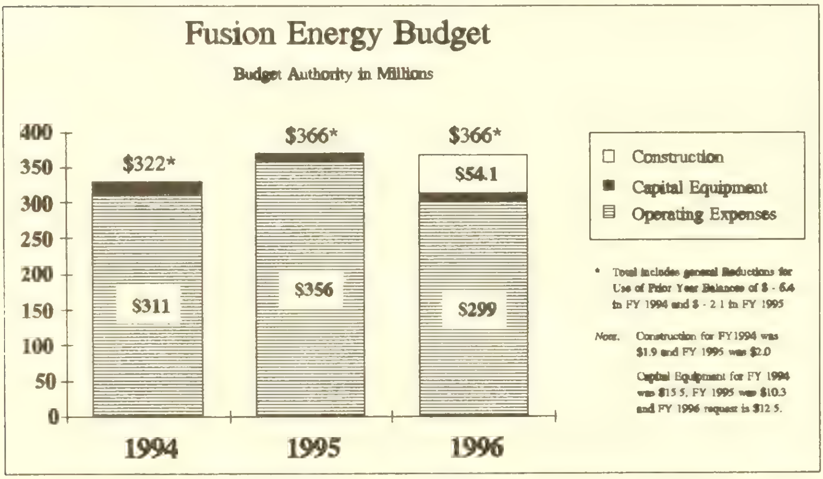
Because of the high cost of the Advanced Neutron Source (ANS) and overall budget constraints, no FY 1996 funds have been requested for the ANS. Funds remaining in FY 1995 for ANS will be identified in a proposed reprogramming request to the

Congress. These funds will be used instead to begin research, development and design for a spallation neutron source. Such a facility would meet most of the Nation's needs for neutron scattering research for less cost than the ANS. The Basic Energy Sciences budget also contains $8 million for the conceptual design of the spallation neutron source. This research and development effort will make use of the best capabilities in the Department's laboratories, including the Accelerator Production of Tritium (APT) project sponsored by Defense Programs at Los Alamos National Laboratory.

Making Fusion Energy Possible

The fusion program has made steady progress toward the goal of developing fusion as a source of electricity. The results from the program are at the cutting edge of both science and technology. The scientific discipline of plasma physics, for example, was established by the fusion program because it was needed for fusion development. Plasma physics is now used in a variety of other important areas such as understanding the near-earth space environment and its effects on communications.

Progress in the past two years, in particular the achievement of record energy production of 10.7 megawatts of fusion power in the Tokamak Fusion Test Reactor, has significantly enhanced the prospects for demonstrating the scientific feasibility of fusion power. Extending this achievement to a commercial reality will require additional facilities. The FY 1996 budget provides for design and engineering of the Tokamak Physics Experiment (TPX), essential to the development of more efficient and economically attractive commercial designs, and for the International



* Total includes general Reductions for Use of Prior Year Balances of $ - 6.4 in FY 1994 and $ - 2.1 in FY 1995

Note. Construction for FY 1994 was $1.9 and FY 1995 was $2.0

Capital Equipment for FY 1994 was $15.5, FY 1995 was $10.3 and FY 1996 request is $12.5.

Thermonuclear Experimental Reactor (ITER). Design of ITER and consideration of its construction are being done in an international partnership with Japan, the European Community, and the Russian Federation. ITER would fully demonstrate the scientific and technological feasibility of fusion. The President's Committee of Advisors on Science and Technology (PCAST) is conducting a review of the Department's fusion program, which should be completed this summer. Start of TPX construction will await these PCAST recommendations.

Partnerships in Progress

University-Industry-Laboratory Partnerships

Our Laboratory Technology Transfer program has supported over 200 Cooperative Research and Development Agreements (CRADAs) with industry in the past two years and we have over 800 documented collaborations with industry across all sectors of the economy. Notable examples are:

- the Complex Carbohydrates Center at the University of Georgia, initiated with Energy Research funding, where complex chemical structures have been analyzed for over 135 corporations. Several new firms are being established based on the knowledge and techniques emerging from this Center;

- the AMTEX^{TM} Partnership with the U.S. textile industry that is strengthening America's global competitiveness through technology development and deployment. Based on progress to date in this program, there is a reasonable prospect for recapturing up to 50 percent of business lost to imports over past decades, resulting in the creation of 250,000 jobs in the next 10 years;

- the Partnership for New Generation Vehicles (PNGV), led by the Department of Commerce, which includes CRADAs sponsored by the Offices of Energy Research, Energy Efficiency and Renewable Energy, and Defense Programs. For example, this program is developing new computer models of combustion that will allow confident predictions of emissions from advanced automotive designs; and

- a cooperative program involving the Offices of Energy Research, Defense Programs, and Fossil Energy in support of the Administration's Advanced Computation Technology Initiative, utilizing CRADAs with industry that will increase domestic oil and gas production and make more efficient use of these scarce resources.

Small Business Innovation Research

The Office of Energy Research contributes to the Nation's industrial competitiveness through its management of the Small Business Innovation Research (SBIR) and the Small Business Technology Transfer (STTR) programs for the Department of Energy. These programs are mandated by Public Law 102-564, which requires 11 Federal agencies, including the Department of Energy, to set aside a percentage of their extramural research and development budgets (2.0 percent in FY 1996 for SBIR and 0.1 percent for STTR) to fund innovative research and development projects from small businesses. Now in its thirteenth year, the SBIR program fosters the conversion of that research and development into valuable new technology of economic benefit to the Nation.

Under Energy Research's stewardship, the Department's SBIR program continues to be one of the most successful SBIR programs in the Federal government. The Department's unique Commercialization Assistance Program has helped SBIR companies commercialize the results of their research. Projects completed between 1986 and 1990 have already generated over $260 million for the commercialization of their products and processes, substantially more than the $150 million in funding provided by the SBIR program for these projects.

These remarks conclude my overview of the Office of Energy Research's programs, our accomplishments, our hopes for the future, and our belief that these programs are among the very best in the world because they have been generously and unstintingly supported and defended by this Subcommittee and its predecessors over almost half a century.

I would now like to discuss the FY 1996 budget request for our programs, which is included under the two appropriations shown in Appendix II-A. The total FY 1996 budget request is about $2.8 billion. I will first discuss those programs which are in the Energy Supply Research and Development appropriation, followed by those in the General Science and Research appropriation.

BASIC ENERGY SCIENCES
(FY 95 - $725.1M -- FY96 - $811.4M)

Materials research is crucial to advanced automotive technologies; the safe and reliable transport, containment and storage of hazardous substances; and the minimization of wastes in the synthesis and processing of commercial materials.

The Basic Energy Sciences (BES) program provides science and engineering research that helps enable the Department of Energy's (DOE's) technology development programs succeed in their missions. By expanding the Nation's scientific and technical knowledge base and facilitating its transfer to DOE's energy technology programs and U.S. industry, the BES program invests in our country's immediate and long-term prosperity. The BES budget request includes $60 million of the $100 million Science Facilities Initiative. The BES program annually funds over 1,400 research projects across a broad spectrum of scientific disciplines at approximately 200 U.S. universities, DOE laboratories, and industrial institutions. These projects support about 4,000 professors, postdoctoral fellows, and graduate students at universities, and nearly 2,000 full-time staff scientists at the laboratories. About a quarter of the research funds goes directly to universities.

In addition to supporting research, the BES program also funds unique national user facilities that are used by the private sector, universities, DOE, and other government agencies. These facilities primarily include synchrotron light sources and neutron sources that are made available to all qualified scientists and engineers. The light sources and neutron sources are necessary to probe atomic and molecular structures and properties required to advance the fields of materials, medical, chemical, and biological science. Over 4,000 users, including hundreds of industrial scientists from about 100 U.S. companies, were accommodated at the seven major BES scientific user facilities in 1994. These facilities are: the National Synchrotron Light Source at Brookhaven National Laboratory; the Advanced Light Source at Lawrence Berkeley Laboratory; the Stanford Synchrotron Radiation Laboratory at the Stanford Linear Accelerator Center; the Combustion Research Facility at Sandia National Laboratories-Livermore; the High Flux Isotope Reactor at Oak Ridge National Laboratory; the High Flux Beam Reactor at Brookhaven; and the Intense Pulsed Neutron Source at Argonne National Laboratory. The 6-7 GeV Synchrotron Radiation Source at Argonne, a new facility that will provide a diagnostic beam of radiation unsurpassed in intensity by any available source today, is proceeding on schedule for completion in 1996. Many areas of modern science require these major facilities to develop information not otherwise attainable and, in general, only the Federal government can provide the necessary funds. As such, these facilities are one of the most effective means of transferring scientific information and technology from fundamental research to application.

All BES research is of high scientific quality and also highly relevant to current DOE missions and the Department's future success. Research in BES originates from the scientific community through proposals from universities, government laboratories, and industry. BES provides broad guidance on strategic directions obtained through working relationships with other DOE programs, research workshops, and policy directives, to which the scientific community responds with their best ideas. Researchers are encouraged to pursue solutions to the most challenging and interesting problems which are appropriate for the Department, and partnerships are formed with other DOE programs to foster technology transfer. The BES program supports the Department's Energy Resources missions in the areas of energy efficiency, renewable energy resources, improved utilization of fossil fuels, reduced environmental impacts of energy use, and future fusion energy sources. In support of the Environmental Quality missions of the Department, the BES program provides fundamental understanding to help eliminate the risks posed by past activities and prevent or minimize the environmental impact of departmental actions. These approaches to basic research funding have led to 120 Cooperative Research and Development Agreements (CRADAs) which extend the basic research to applications and development. In addition, partnerships with the industrial sector involve over 700 other direct collaborations between BES researchers and industrial researchers.

FY 1996 BASIC ENERGY SCIENCES BUDGET REQUEST

Budget Authority in Millions

Energy Supply R&D Basic Energy Sciences	FY 1994	FY 1995	FY 1996 Request
- Operating Expenses	598.4	624.5	730.0
- Capital Equipment	43.5	39.0	57.0
- Construction	115.9	70.4	24.4
Subtotal Basic Energy Sciences	757.8	733.9	811.4
- Less General Reduction	- 14.2	- 8.8	-
Total Basic Energy Sciences	$ 743.6	$ 725.1	$ 811.4

A more detailed budget table for Basic Energy Sciences is provided in Appendix II-B.

The FY 1996 budget request for Basic Energy Sciences is $811.4 million. The request includes $730.0 million for Operating Expenses, $57.0 million for Capital Equipment, and $24.4 million for Construction. The Operating Expenses request is distributed among seven subprograms, Materials Sciences, Chemical Sciences, Applied Mathematical Sciences, Engineering and Geosciences, Advanced Energy Projects, Energy Biosciences, and Program Direction.

The Materials Sciences subprogram supports materials research programs and national user facilities that enable improvements in existing technologies or the creation of new ones. This subprogram, for which $348.3 million is requested in FY 1996, creates new knowledge of materials structures and properties that is necessary for attacking scientific and technological barriers to commercialization and identifying previously unknown problems that must be addressed for emerging technologies and markets.

Materials sciences is an enabling technology. The performance parameters, economics, environmental acceptability and safety of all energy generation, conversion, transmission, and conservation technologies are limited by the performance of materials. Materials research is also crucial to advanced automotive technologies; the safe and reliable transport, containment and storage of hazardous substances; and the minimization of wastes in the synthesis and processing of commercial materials. Research in the Materials Sciences subprogram is concerned with optimizing the behavior and performance of materials for these technologies. This research seeks to understand the synergistic relationship among the synthesis, processing, structure, properties, and behavior of a diverse range of materials. The FY 1996 budget request would support strategic basic research in such topics as aqueous and galvanic corrosion, high temperature gaseous corrosion, neutron induced irradiation damage, welding and joining, high rate and superplastic metal forming, processing for high surface hardness, metallic glasses, solar photovoltaics, high temperature structural ceramics and ceramic matrix composites, solid ceramic electrolytes for batteries and fuel cells, and non-destructive evaluation and early warning of impending materials failure. The subprogram is also a major supporter of basic research in high temperature superconductivity, magnetic materials, high temperature alloys and the synthesis, processing, and performance of materials in systems to optimize safety and minimize environmental hazards, wastes, and risks. The Materials Sciences request also provides for much of the funds for the operation of many of the Basic Energy Sciences national user facilities identified earlier.

The Chemical Sciences subprogram, with a FY 1996 Operating Expenses request of $181.6 million, investigates the atomic and molecular properties of matter and the interactions of its components. Its objective is to expand our knowledge in the various areas of chemistry and aligned scientific disciplines with the goal of contributing to new or improved processes for developing and using domestic energy resources. Chemical Sciences research ultimately affects such areas as production of fuels and chemicals from coal and other carbonaceous resources including biomass; environmental restoration and waste management; and the efficient and safe utilization of energy sources. For example, this subprogram will support research using specific catalysts to derive an array of valuable chemicals and transportation fuels from natural gas. Similarly, it will yield new fundamental information which will help improve the conversion of coal to diverse valuable products ranging from high-octane fuel to basic chemicals.

The success of the Department's long-term program in environmental restoration will depend, in part, upon obtaining a fundamental molecular level understanding of interactions between dissolved materials in aqueous systems and soil-type substrate surfaces. Chemical Sciences supports a multi-disciplinary approach to studies of the dynamics of chemical reactions. These studies will provide insights into the chemistry involved in combustion, allowing development of more efficient and cleaner combustion systems while elucidating fundamentals of chemical reactivity. In FY 1996, the research program will emphasize areas relevant to combustion, catalysis, the environment, waste management, advanced batteries for nonautomotive applications, materials precursors, and atomic and plasma sciences. The FY 1996 budget request also includes support for some of the major scientific user facilities such as the Combustion Research Facility and the High Flux Isotope Reactor.

The Applied Mathematical Sciences subprogram supports a spectrum of activities ranging from fundamental, long-range mathematical and computational research that underpins all of the Department's programs to the management and operation of a leading edge information infrastructure. This subprogram, for which $108.7 million of Operating Expenses is requested in FY 1996, contributes to the multi-agency High Performance Computing and Communications (HPCC) program, and advances all aspects of scientific computation. The driving requirement for the HPCC program is to advance the fundamental concepts and techniques which underpin all energy sciences and development. On focus is to enable the solution of "grand challenge" problems in computational science that have major scientific and economic impact, such as the design of advanced materials or the understanding of combustion dynamics and catalysis. The HPCC program will substantially expand and accelerate development of a new generation of computing and communications technologies, facilities, applications, and trained personnel. In fact, an important goal of the HPCC initiative has been to encourage young men and women to pursue careers in science and engineering and to participate in the computational sciences in the U.S. The Applied Mathematical Sciences subprogram has made significant contributions to achieving that goal by providing scholarships, fellowships, and opportunities for postgraduate students to participate in its research activities, and by supporting some very innovative projects to attract minorities and women into the sciences, to teach and assist teachers in math and science education, and to develop new tools and curricula for computational science education.

The FY 1996 budget request for Applied Mathematical Sciences will also provide for a few selected research and development activities required for a national information infrastructure (NII). A feasibility study has validated the merit of a national information infrastructure application in energy demand and supply management. The FY 1996 request will provide for funding application prototypes in this area and those technologies that are critical to realizing the benefits of energy demand management and other NII applications. The FY 1996 request will also provide for the upgrade of the advanced prototype parallel computing systems at one of the High Performance Computing Research Centers. In FY 1996, this subprogram will also begin an important project to transition massively parallel computing systems from the research environment into more production computing-oriented environments to help promote their utility in the commercial sector. The request also provides for completion of the first set of upgrades for the Energy Sciences Network, the first multi-protocol, Internet-compatible, data communications network which provides the core connectivity and functionality to the energy research community. In addition, this subprogram will conduct fundamental computational and computer sciences research and development as part of the Department's participation in the Advanced Computational Technology Initiative.

The Engineering and Geosciences subprogram has a FY 1996 Operating Expenses request of $39.9 million. Research in engineering focuses on enriching fundamental understanding of systems and processes that underlie current engineering practices in energy technologies and provides the technical and conceptual base for solving future problems. The FY 1996 request provides for continuing fundamental engineering research, with emphasis on topics important for energy production and use, as well as for meeting the Department's long-term objectives for environmentally friendly industrial design and restoration of the environment. Such topics include bioprocessing of fuels and energy-related wastes; design of techniques to increase the service life of complex energy-related structures; flow of oil, gas, and water through porous materials similar to soil and rocks; and two phase flow in energy systems, for instance, mixtures of oil and gas in pipelines. Work will also continue on intelligent machines and intelligent controls contributing to increased industrial productivity and improved handling of hazardous wastes.

Geosciences research emphasizes behavior and properties in the outer few kilometers of the earth's crust. Geologic fluids such as oil, gas, geothermal brines, magma-hydrothermal solutions, and water move within and interact with these few kilometers of the crust. In Geosciences research, a number of techniques, such as underground imaging, computer modeling, and experimental simulation, are used to develop theories to explain the origin and development of geologic structures and their interactions. Theories are then tested directly by drilling, sampling, down-hole experiments, and additional surface-based observations. The FY 1996 budget provides for sustaining research in underground imaging, for scientific drilling, and for experimental studies of the interactions of minerals and fluids with the crust, all areas of critical importance to energy and environmental technologies. It also provides for geophysical research and modeling which support the Advanced Computational Technology Initiative.

The Advanced Energy Projects subprogram, with a FY 1996 Operating Expenses request of $12.0 million, explores the feasibility of high-risk, energy-related ideas that could lead to significant opportunities for the Nation's energy future. These novel ideas are often catalyzed by a significant advance in basic research. They often involve more than one scientific discipline and are considered to be premature for consideration by the Department's technology development programs. Research support is provided for about three years to test each idea. After that, if the concept has sufficient promise, it is expected to be in a position to attract follow-on funding from other sources, which can include private funds. The FY 1996 request will maintain the subprogram's present level of research effort in the Department's mission areas by supporting strategic research such as exploring novel processes for manufacturing high temperature superconducting magnets and developing new, high-precision techniques for mapping oil and gas fields.

The principal objective of the Energy Biosciences subprogram is to provide the fundamental information and conceptual understanding necessary to develop tomorrow's energy-related biotechnologies. The program emphasizes the microbiological and botanical sciences in support of the Department's efforts for the production of renewable fuels and chemicals, the microbial conversion of biological resources into useful and novel products, and the development of methods for the elimination or reduction of environmental pollutants. The research focuses on the basic mechanisms affecting plant productivity, conversion of biomass and other organic materials into fuels and chemicals by microbial systems, and the ability of biological systems to replace energy-intensive processes in an efficient and environmentally-friendly way. The potential of these biotechnologies to have a dramatic impact on future energy use and production, as well as commercial activities, is high. The FY 1996 Operating Expenses request of $29.5 million will provide for the continuance of the subprogram's support of research efforts to exploit, to the fullest extent possible, the enormous potential of modern biotechnologies.

The Program Direction request for Basic Energy Sciences for FY 1996 is $10.0 million. This request provides funds for the salaries, benefits, travel, and other expenses related to 85 full-time equivalents required to administer this program.

The Basic Energy Sciences Capital Equipment request for FY 1996 is $57.0 million. These funds will permit Basic Energy Sciences-supported researchers to have the necessary equipment needed to initiate and continue advanced research, much of which involves experiments at extremes of temperature and pressure. Reliable, precise measurements under these conditions challenge the current state-of-the-art. Replacement and new equipment funded under this request, which is essential to the continued success of the program, includes such items as electron microscopes, neutron spectrometers, molecular beam equipment, and computers for equipment control and data analysis.

Budget Authority in Millions

Energy Supply R&D - Basic Energy Sciences (Construction Summary)	TEC	FY 1995	FY 1996 Request
- 6-7 GeV Synchrotron Radiation Source (ANL) (89-R-402)	467.2	58.4	3.2
- Combination Research Facility-II (87-R-405)	26.8	0.0	2.0
- Accelerator and Reactor Improvements Projects	N/A	7.5	12.9
- General Plant Projects (GPE-400)	N/A	4.5	6.3
Total Basic Energy Sciences Construction		$ 70.4	$ 24.4

The FY 1996 Construction request of $24.4 million includes $3.2 million to complete construction of the 6-7 GeV Synchrotron Radiation Source at Argonne National Laboratory (also referred to as the Advanced Photon Source) and $2.0 million for the Combustion Research Facility, Phase II, at Sandia-Livermore. It also includes $12.9 million for Accelerator and Reactor Improvements Projects and $6.3 million for General Plant Projects. Each of these latter two categories is comprised of smaller projects which are necessary to maintain plant and facilities at several DOE laboratories. The projects include a wide spectrum of improvements necessary to maintain property and protect personnel and to modify existing scientific facilities to allow the most cost-effective utilization of their technical capabilities.

ADVANCED NEUTRON SOURCE

As indicated earlier, because of increasing constraints on the budget and the high cost of the Advanced Neutron Source (ANS), no FY 1996 funds will be requested for the ANS. To accommodate the needs of the Nation for neutron scattering, the Administration will propose to reprogram funds remaining after ANS termination in FY 1995 to support the initiation of research, development, and conceptual design for a spallation neutron source. Part of this effort will include an environmental review with Oak Ridge National Laboratory as the preferred site, but with alternative sites also being considered. The spallation neutron source will meet most of the needs for neutron scattering research for less cost than the ANS. The Basic Energy Sciences budget also contains $8 million for the conceptual design of the spallation neutron source. This research and development effort will make use of the best capabilities in the Department's laboratories, including the Accelerator Production of Tritium (APT) project sponsored by Defense Programs at Los Alamos National Laboratory.

FUSION ENERGY

(FY 95 - $366M -- FY96 - $366M)

In 1994, the Princeton Plasma Physics Laboratory's Tokamak Fusion Test Reactor generated a world record 10 million watts of fusion power.

Fusion Energy offers the potential of an environmentally acceptable, economically competitive energy source with a virtually unlimited and widely available fuel supply. Growing world population, industrialization of the developing countries, environmental degradation, concerns about the security and availability of present fuels, and the need to replace existing electric generating facilities led to the need for the development of fusion energy technology to support sustainable development. Development of fusion energy technology, however, requires a long-term commitment to a capital-cost-intensive and high risk development program, making development of fusion by the private sector impossible. Therefore, it is an appropriate role for the Federal government to assume responsibility for the development of fusion energy until the private sector can make reasonably informed decisions on whether and how to commercialize fusion.

In magnetic fusion, strong magnetic fields are used to confine the fusion fuels, deuterium and tritium, which are heavy forms of hydrogen. The research program is focused on how best to arrange the magnetic fields and how to heat, fuel, and maintain the purity of the fuel. The majority of effort in magnetic fusion research is focused on a donut-shaped device known as a "tokamak," the name given to it by its Russian inventors. The tokamak is the approach that, after many years of research, is judged to have the best chance of being made into a power plant. Recent experiments in the Tokamak Fusion Test Reactor (TFTR) located at the Princeton Plasma Physics Laboratory (PPPL), have produced over 10.7 million watts of fusion power for a fraction of a second. This is a world record for the production of fusion power and it has provided the first opportunity to study the phenomena associated with energy release in the fusion device.

In inertial fusion, powerful beams of light or particles are used to heat and compress a pellet of fuel on a time scale so fast that the pellet does not have time to fly apart during the process. The research program is focused on understanding the interaction of these beams with the fuel pellet, and on the development of efficient, reliable particle accelerators. The science of the beam-pellet interaction is being carried out by the Office of Defense Programs. The development of components for energy applications is being carried out in the Office of Fusion Energy and is limited to a single area, heavy ion accelerators, which is in its initial stage of development.

The Department has an established policy for the fusion program to conduct a goal-oriented fusion energy development program that would have a demonstration power plant operating by about 2025, and a commercial power plant operating by about 2040. In addition, the Energy Policy Act of 1992 calls for the program to conduct a technology demonstration of the practicability of commercial fusion energy by 2010. The Department's policy is based on a commitment to international collaboration throughout the program.

Because of the magnitude of the funding requirements for the development of fusion and because of the strategy to make major use of international collaboration, it is essential to establish a national commitment to the development of fusion energy in order to proceed effectively. To this end, and consistent with a Congressional request included in the Energy and Water Development Appropriation Conference Report for 1995, the President's Committee of Advisors on Science and Technology (PCAST) will evaluate the appropriate pace and direction of the fusion energy program. The fusion program described here will be modified, if appropriate, based on that review. This review is anticipated to be completed by the summer of 1995.

While the fusion program has made tremendous progress, there are still several major technical issues that must be addressed. The current magnetic fusion program strategy is focused on resolving these issues so that a tokamak magnetic fusion power plant can be operated to demonstrate that fusion is an economically competitive source of electricity. Four major activities have been identified as necessary to accomplish this objective.

The first activity involves the need to understand the physics of igniting and maintaining a "burning" plasma in a fusion power plant. In addition, a database for the design and operation of the components needed in a fusion power plant must be developed. Each of the world's major fusion programs has independently reached the conclusion that a large tokamak to address these issues should be the next step in fusion development. To this end, the European Community, Japan, the Russian Federation, and the U.S. have signed an agreement to do the engineering design and appropriate research and development for the International Thermonuclear Experimental Reactor (ITER). I will come back to ITER in a moment.

The second activity involves the development of advanced materials that will not become highly radioactive in a fusion power plant environment. The international community has agreed that the development of advanced materials requires the building of a materials testing facility that will produce an intense beam of neutrons at energies typical of those in a fusion power plant.

The third activity is the development and testing of the component needed to extract the energy from the fusion reactions in a manner that can be used to generate electricity. This component, commonly referred to as the "blanket," also contains material that is converted to tritium, for additional fusion fuel, when exposed to the neutrons from fusion reactions. This new fuel is then recycled into the power plant to keep it operating. Several different types of blankets would be tested in ITER after the completion of the work required for the first activity I described.

The fourth activity addresses the need to improve the power plant embodiment of fusion. The Tokamak Physics Experiment (TPX) will offer a unique opportunity to develop the scientific basis for a continuously operating, cost competitive demonstration power plant by making it smaller, more efficient, and, thus, less expensive to build and operate than would otherwise be possible. The TPX, which could be operating before ITER, would contribute to improved operation of ITER, when ITER is conducting the part of its mission that requires continuous operation for engineering testing. TPX would also provide the benefit of helping to maintain a strong domestic program so that the U.S. would be able to take advantage of the information learned in the design and operation of ITER. In building the TPX, U.S. industry will gain valuable experience that will allow it to successfully compete with industry abroad for the large contracts that will be established for the construction of ITER.

Underpinning all of these activities is the supporting physics and enabling technologies. The former includes medium and small-scale tokamak experiments, diagnostics, theory and modeling, and a small amount of work on non-tokamak options. The list of enabling technologies being developed with DOE funding includes the development of magnets, vacuum systems, heating and fueling systems, heat-resistant materials, and other auxiliaries required to implement experiments.

The purpose of ITER is to demonstrate the scientific and technological feasibility of fusion. ITER would be the first fusion device ever to achieve the sustained burn of a deuterium-tritium plasma. It would provide a test bed for the technologies needed to build and operate a demonstration electrical power plant.

The ITER Engineering Design Activities (EDA) began in July 1992 and will be completed in July 1998. The scope of the EDA provides for the design of ITER and the associated research and development so that this information will be available to the four ITER Parties to use as part of an international collaborative program to construct ITER or to use in their own domestic programs.

The ITER Council, which provides overall direction and supervision of the EDA, acted in mid-1994 to appoint Dr. Robert Aymar of France as the new Director. The Council also appointed Dr. Robert Iotti from Ratheon Ebasco as Administrative Officer. These appointments, together with other key management changes, are aimed at improving the EDA efficiency and effectiveness.

The next major milestone for the EDA is preparation, by June 1995, of the Interim Design Report, which will provide detailed cost and schedule estimates for ITER construction, as well as site requirements. This report will be reviewed thoroughly by the Parties and will strongly influence the Parties' views on whether and how to proceed with planning for ITER construction.

The ITER Parties have not yet made a commitment to ITER construction. U.S. participation in the construction and siting of ITER will require a major policy decision that goes beyond technical issues and considers economic benefits, personnel and financial resources, and safety and environmental issues, as well. As part of developing a U.S. Government position on these issues, the Department is engaged in discussions within the Administration and will continue to consult with Congress.

Returning to our domestic program, the Department plans to construct TPX at PPPL, using the TFTR building and much of its existing auxiliary systems. This approach would make efficient use of the significant investment that has already been made in developing a fusion research capability at PPPL. The TPX will provide the basis for the design of more compact and economically competitive fusion power plants. Based on current assumptions of annual funding levels, the Total Project Cost of TPX is estimated at $742.0 million (in as-spent dollars) with project completion late in 2001. Once completed, it would be the only large U.S. tokamak operating in the early years of the 21st Century and would serve as the mainstay for our domestic fusion program in support of ITER. As I indicated earlier, actual construction of TPX will await the results of the PCAST review.

The TPX and ITER would enjoy a productive synergism. TPX would be the first tokamak in the world to use superconducting magnets in the geometry similar to that planned for ITER. TPX would benefit from the planned ITER research and development. ITER, in its nuclear testing phase, would benefit from the information developed in TPX.

Another goal of the fusion energy program is to involve U.S. industry more directly in order to facilitate the transfer of fusion technology to the industries that will ultimately design, build, and operate fusion power plants. To this end, both ITER and TPX include industry partners in all aspects of design and research and development.

The Inertial Fusion Energy program strategy, separate from the present science-based stockpile stewardship program of the Office of Defense Programs, will direct its effort to the development of energy-specific components. Because of its high efficiency, anticipated reliability, and high repetition rate, a heavy ion accelerator has been consistently identified as the best driver candidate for inertial fusion energy. The principal requirement is the ability to focus the driver ion beam to a small, high-intensity spot in order to reach the radiation energy required to ignite the target.

In summary, inertial fusion energy has considerable promise, but depends on science and technology development that is carried forward for other purposes. A goal-oriented inertial fusion energy development program would not be appropriate for about a decade after the presently planned program provides fundamental information on physics and the driver.

FY 1996 FUSION ENERGY BUDGET REQUEST

Budget Authority in Millions

Energy Supply R&D Fusion Energy	FY 1994	FY 1995	FY 1996 Request
- Operating Expenses	311.2	356.1	299.4
- Capital Equipment	15.5	10.3	12.5
- Construction	1.9	2.0	54.1
Subtotal Fusion Energy	328.6	368.4	366.0
- Less General Reduction	- 6.4	- 2.1	-
Total Fusion Energy	$ 322.2	$ 366.3	$ 366.0

A more detailed budget table for Fusion Energy is provided in Appendix II-C.

The Administration recognizes that significant budgetary commitments are required to meet the previously stated goals. The review of the fusion programs by PCAST and the Office of Science and Technology Policy will include an examination of U.S. participation in ITER construction and the role of the planned TPX facility.

The FY 1996 budget request for Fusion Energy is $366.0 million. The request includes $299.4 million for Operating Expenses, $12.5 million for Capital Equipment, and $54.1 million for Construction. The request supports four essential program elements for magnetic fusion energy, including participating in the engineering design phase of ITER, initiating construction of the TPX, continuing a base program of physics and technology support, and initiating the safe shutdown and decommissioning of the TFTR facility following the completion of the ongoing experimental program. In addition, support continues for development of inertial fusion components for energy applications, including initiating construction of the Elise, a heavy ion accelerator facility at Lawrence Berkeley Laboratory.

The Operating Expenses budget for the Fusion Energy Program is allocated among six subprograms. For the Confinement Systems subprogram, $131.5 million is requested for Operating Expenses. This request provides for the safe shutdown of the TFTR facility and the beginning of preparations for removal of the tokamak. Scientists from the TFTR program will begin collaborative efforts on other tokamak facilities in the U.S. and abroad and will complete the analysis of data from the deuterium-tritium experiments. Research and development and prototype development for the TPX project will continue, but at a reduced level as construction activities begin. The TPX is designed to lead to an improved tokamak power plant and to increase the U.S. ability to contribute to and benefit from the ITER program. The TPX will be used to develop operating techniques that would permit design of smaller, less expensive tokamak power plants. It will provide the scientific basis to move from operating times of one or two seconds to the continuous operation needed for an attractive fusion power plant. The total increase in funding for TPX of $20.1 million over the FY 1995 level is more than offset by a decrease in funding for TFTR of about $26.4 million.

The DIII-D tokamak experiment at General Atomics and the Alcator C-Mod tokamak experiment at the Massachusetts Institute of Technology will be operated to provide information for the design and operation of ITER and TPX. DIII-D will focus on experiments using more efficient techniques to "drive" current in high-pressure plasmas. Alcator C-Mod will study techniques to confine high density plasmas using a "magnetic divertor" to handle the power and particles coming out of the plasma and interacting with the walls of the vacuum chamber, one of the most critical issues faced in the ITER design. In addition, we will continue activities to shut down the Princeton Beta Experiment (PBX-M) at PPPL. Some U.S. scientists will continue to be involved in international collaborations to keep abreast of developments on alternate confinement concepts, such as reversed field pinches and stellarators, since major work on these concepts has been terminated in the U.S. but is being continued abroad.

The Operating Expenses request of $48.8 million for the Applied Plasma Physics subprogram would support experimental and theoretical research to improve the understanding of fusion physics principles and to investigate innovative techniques leading to improved plasma confinement conditions. This subprogram supplements research in the Confinement Systems subprogram by developing and using new diagnostic systems, developing plasma heating and control concepts, and producing basic scientific data necessary to design and conduct power plant-scale fusion experiments. A significant portion of this activity is focused on improving the understanding of how energy and particles are lost from the plasma by mechanisms that "transport" them across the magnetic fields that confine the plasma. We will continue to support the development of new diagnostic tools for use on ITER and TPX and also small-scale studies on selected non-tokamak fusion energy concepts. About one-half of these activities are carried out by universities. Fusion computing and operation of the central computing activity at the Energy Research Supercomputer Center at Lawrence Livermore National Laboratory are also supported under this subprogram.

The request of $100.4 million of operating funds for the Development and Technology subprogram is primarily for the support of U.S. participation in ITER. The funding requested for ITER is to provide the U.S. share of the EDA phase of the project, which includes the engineering design, supporting technology research and development, and development of model components that could be scaled up to full size. The costs of hosting the San Diego Co-Center for the ITER Joint Central Team are covered, as well. This subprogram also supports a base technology program to develop magnets, heating systems, blankets, and materials for existing and planned experiments. Funding is also included for the long-range development of advanced materials that will not become highly radioactive during service in the power plant, thereby enhancing safety and simplifying waste disposal. Fusion system studies will continue to evaluate the commercial applications of fusion power.

The FY 1996 Operating Expenses request also includes $3.1 million for the continuing research and development in the Inertial Fusion Energy subprogram. The primary effort will be focused on the physics of heavy ion acceleration. This program will rely on the continuing development of inertial fusion target physics and ignition characteristics information supported by the Department's Defense Programs' budget. Where possible, international cooperation will be pursued to speed overall progress in inertial fusion energy.

The Operating Expenses request also provides $9.6 million in Program Direction funds for the salaries, benefits, travel and other expenses associated with 82 full-time equivalents required to administer the Fusion Energy program by the Headquarters staff and those at Department of Energy Operations Offices; and $6.0 million in the Planning and Projects subprogram primarily to support the program's legal obligation to the Small Business Innovation Research Program.

The FY 1996 Capital Equipment request of $12.5 million provides for procurement of essential hardware to support the overall program. This includes diagnostic and computer equipment, power supplies, and other components which are essential for conducting research on our experimental facilities. Support for the upgrade of the DIII-D facility to increase its experimental capabilities will continue.

Of the $54.1 million in FY 1996 Construction funds, $49.9 million is required for the TPX project to complete Title I design activities, begin Title II design, and procure long-lead materials

Budget Authority in Millions

Energy Supply R&D - Fusion Energy (Construction Summary)	TEC	FY 1995	FY 1996 Request
- Elise (96-E-310)	20.2	0.0	3.2
- Tokamak Physics Experiment (94-E-200)	610.0	0.0	49.9
- General Plant Projects (GPE-400)	N/A	2.0	1.0
Total Fusion Energy Construction		$ 2.0	$ 54.1

and superconducting magnets. In addition, $3.2 million is provided to initiate the Elise project, a linear heavy ion induction accelerator facility that will produce intense ion beams to test many of the features of a heavy ion induction accelerator driver for inertial fusion energy production. The remaining $1.0 million is for General Plant Projects, which provide for the continuing minor alterations and modifications necessary to meet health, safety, and programmatic requirements and to protect the Government's investment in its facilities.

BIOLOGICAL AND ENVIRONMENTAL RESEARCH
(FY 95 - $431.2M -- FY 96 - $431.7)

> ***Technology which has evolved from the Department's nuclear medicine program is now being used in more than 100 million diagnostic and therapeutic procedures performed annually.***

The Biological and Environmental Research (BER) program supports peer-reviewed research to identify, understand, and anticipate the health and environmental effects of energy use and development. The information developed will also facilitate the understanding of, and technological solution to, major problems in biology, medicine, and the environment. The program uses the unique multidisciplinary research capabilities and facilities of the national laboratories, and supports research conducted by faculty and students from universities throughout the U.S. that is focused on six major subprogram areas. These areas are: Health Effects, General Life Sciences, including the human genome, Medical Applications, Environmental Research, Carbon Dioxide Research and Global Change, and Analytical Technology. New knowledge and technologies from these research areas will help define the long-term human health and environmental risks from energy production and use. Products of the research will help develop and apply new environmental remediation and protection technologies and facilitate the commercialization of innovative medical diagnostic and therapeutic technologies. Better understanding of these areas will provide infrastructure and technologies crucial to advancing the U.S. biotechnology industry, permit more cost-effective health care, and improve predictions of the effects of increasing greenhouse gases on the earth's climate on regional and global scales and the potential environmental and economic consequences of human-induced climatic change.

Health Effects Research focuses on developing the information necessary to predict more accurately the risk of mutations, cancer, or heritable damage from low doses of radiation or energy-related chemicals. To reduce the uncertainty in current risk estimates, the fundamental mechanisms for interaction between cells and radiation must be understood, particularly mechanisms of radiation-induced genomic instability and carcinogenesis. The current models for predicting exposure and risks are limited to making predictions of risk to total populations. There is a need for new monitoring and health surveillance methods that detect exposure and predict risks based on individual susceptibility to low-level exposure to chemicals and radiations. Factors affecting individual susceptibility to toxic agents or to disease vary among people and may significantly alter the consequences of exposure to environmental or workplace exposures. The Health Effects Research program includes research to develop new molecular-based tools for health surveillance and biological dosimetry and emphasizes the determination of the genetic basis for individual susceptibility to disease-inducing exposures. Research is also conducted to increase scientific understanding, at the cellular and molecular levels, of fundamental mechanisms of long-term health effects (e.g., cancer, immune system impairment, etc.) of exposure to energy-related materials.

The General Life Sciences Research subprogram focuses on structural biology, molecular and cellular biology, and human genome research. Structural biology, which seeks to understand the relationship of the structure of biological molecules to how they function in living cells, is central to future progress in biotechnology. Structural biology plays a critical role in several missions of the Department, including the rational design of macromolecules with uses in environmental remediation, energy technologies, studies of the health effects of energy development and use, and the development of improved energy-saving processes for industry. The Department conducts structural biology research and development at facilities widely used by academic and industrial scientists, including, for example, the Advanced Light Source, the Advanced Photon Source (beginning next year), and the Stanford Synchrotron Radiation Laboratory.

In molecular and cellular research, scientists seek an understanding of processes that damage and repair biological macromolecules. That knowledge reflects the genetic factors of individual susceptibility to disease and possible health risks from exposure to energy-related materials. Research is also conducted to develop biomolecules of potential significance to biotechnology and to define the genetic characteristics of industrially important microbes.

Human genome research continues to develop and apply the resources and technologies needed to construct chromosome maps and determine the sequence of DNA subunits of each of the 24 different human chromosomes. Increased emphasis is on enhancing automated large-scale DNA sequencing, improving linkages among biological databases of genomic DNA sequences and maps, and expanding capabilities for access to genome information. The ultimate goal of this research is to decipher all three billion DNA subunits that make up the genetic code in each cell of our bodies. The results of genome research will provide insights into the fundamental processes of all living organisms. It will also provide the ultimate genetic and molecular basis for improved risk estimates, detailed understanding of the mechanisms of disease, and the assessments of individual sensitivities to low levels of exposure to physical and chemical agents.

The Department's genome program is heavily oriented toward technology development and has spawned significant joint endeavors with industry. Human genome research continues to have significant impacts in biotechnology and medicine. For example, the capability for economical screening of large numbers of DNA samples using short sequences of DNA subunits with massively parallel computers has been developed and implemented at Argonne National Laboratory. This technology, along with the necessary computational support, has now been transferred to the private sector for commercialization. Also, a $6.8 million Cooperative Research and Development Agreement (CRADA) was signed between Lawrence Livermore National Laboratory and a company, Perkin-Elmer, aimed at the development of analytical instrumentation to accelerate DNA sequencing. Another important component of the human genome program is the continuing study of the ethical, legal, and social issues related to applications of information coming out of human genome research.

The General Life Sciences subprogram will also include new research in computational biology in FY 1996. While computational biology spans the full range from biological informatics and databases to computational structural biology, this initiative will focus on the development of software and computer simulations needed to achieve a better understanding of the relationship between structure and function of biological molecules such as proteins and nucleic acids. This research will cut across several BER programs and link both experimental and computational research results through the use of computer science and information technology. The ability to predict the functions of biological molecules will be a key factor in the application of biotechnology to diverse areas of national need, including better understanding of the health consequences of environmental contamination, enhanced uses of bioremediation, and improved structure-based drug design. The Department has unique computational capabilities that can be brought to bear on these problems, and the combination of these capabilities with the experimental data on proteins and nucleic acids that are evolving from the Office of Energy Research's synchrotron radiation facilities and human genome centers should lead to significant impacts on U.S. competitiveness in biotechnology.

The Medical Applications subprogram carries out our responsibility to develop beneficial applications of energy related technologies for medical diagnosis and treatment, and to develop a world class program for sustaining and extending U.S. leadership in the field of nuclear medicine for the 21st Century. The program draws upon the Department's multidisciplinary research and technological capabilities to foster comprehensive research aimed at the preparation of improved radioisotopes and radiopharmaceutical agents, and at the development of advanced medical imaging instrumentation, monoclonal antibodies, molecular nuclear medicine, and boron neutron capture therapy research.

Radiopharmaceutical research involves radioisotopes attached to drugs which are then administered to patients (*in vivo* procedures) for more than 50 different types of diagnostic tests, including bone, heart, lung, brain, thyroid, kidney, liver, gall bladder, and colorectal scanning. The technologies developed will contribute to improved health care delivery while reducing its costs through achievement of earlier diagnosis of diseases such as cancer, development of new approaches to effective cancer therapy, and a more complete understanding of normal organ function and dysfunction in diseased states.

The Environmental Research subprogram conducts research on a wide range of environmental issues, with a common strategic theme of quantifying how energy related agents move through, impact, and are changed by the atmosphere and by terrestrial and marine ecosystems. These are key issue areas within the National Science and Technology Council's (NSTC) Committee on Environment and Natural Resources. For example, research is underway to investigate fundamental physical, chemical, and microbiological processes in the subsurface environment. Such strategic research provides the underpinning for new cleanup technologies in the long term, including the possible application of biotechnology, and the basic understanding necessary to improve predictive capabilities. Research on the microbial genome brings together scientific advances from human genome research and subsurface scientific research to develop biotechnology solutions to environmental remediation. The continued construction of the Environmental Molecular Sciences Laboratory provides a future capability with first-of-a-kind experimental tools to develop advanced technologies for environmental cleanup. Marine research focuses on the role of the coastal regions in the carbon cycle. This directly supports the need to understand the basic physical, biological and chemical mechanisms that control the atmospheric concentrations of greenhouses gases like carbon dioxide. Atmospheric chemistry research is providing information on trends in mid-latitude stratospheric ozone and ultraviolet-B radiation as well as the physical and chemical controls in the atmosphere. Research on terrestrial ecosystems provides basic data on how these systems respond to change. By understanding the fundamental mechanisms of the responses, the impacts of human-induced change (e.g., climate change) can be predicted.

The Department's Carbon Dioxide Research subprogram is designed to improve our predictive understanding of the potential contribution and consequences of energy production and use on the earth's climate system. The research is intended to provide a scientific underpinning for assessing the effects of human activities on the earth's climate, the potential consequences of human-induced climatic changes, and the need for response options for adapting to or mitigating adverse changes. This research is coordinated with that of 11 other agencies through the NSTC's Committee on Environment and Natural Resources. To understand the role of energy-related emissions in human-induced climate change, significant reliance is being placed on developing and improving general circulation models (GCMs). A major goal of the Department's global change research is to foster development of GCMs capable of predicting the timing and magnitude of greenhouse gas-induced global warming and to quantify the regional consequences of such warming. The Department's Atmospheric Radiation Measurement (ARM) research is directed at one of the highest priority science questions and is designed to quantify the effect of clouds and water vapor on the earth's energy balance over a climatologically significant time scale and to determine the best way of capturing these effects in GCMs. ARM consists of coordinated measurements at three sites with different climate regimes; one ARM site is operational and two others are under development. The second site is scheduled to begin its phased deployment in the fall of 1995 and the third site is scheduled to begin operation in 1997. The ARM unmanned aerospace vehicle is providing unique information on cloud properties essential to understand the recently observed enhanced absorption of solar radiation by clouds. The Computer Hardware Advanced Mathematics and Model Physics (CHAMMP) program has delivered a new ocean model using massively parallel supercomputers, providing an improved predictive tool for global climate change research. Ocean research continues to support national and international programs to understand how carbon and heat are stored in the world's oceans. Such an understanding is essential to developing the improved predictive tools for global climate change.

The Analytical Technology subprogram supports development of new measurement technologies required for other BER priority areas in environmental and health effects research, notably, oceanographic measurements related to global climate change, characterization of contaminated subsurface environments, and chemical measurements in biological cells.

FY 1996 BIOLOGICAL AND ENVIRONMENTAL RESEARCH BUDGET REQUEST

Budget Authority in Millions

Energy Supply R&D - Biological & Environmental Research	FY 1994	FY 1995	FY 1996 Request
- Operating Expenses	326.7	341.4	340.6
- Capital Equipment	21.0	24.5	24.0
- Construction	47.5	70.7	67.1
Subtotal Biological & Environmental Research	395.2	436.6	431.7
- Less General Reduction	- 6.9	- 5.4	-
Total Biological and Environmental Research	$ 388.3	$ 431.2	$ 431.7

A more detailed budegt table for Biological and Environmental Research is provided in Appendix II-D.

The FY 1996 budget request for the Biological and Environment Research program is $431.7 million. Of that amount, $340.6 million is for Operating Expenses, $24.0 million is for Capital Equipment, and $67.1 million is for Construction.

The $33.1 million requested for Health Effects Research will support work to improve estimates of the type and magnitude of human health risks that result from exposures to low levels of energy-related agents such as radiation and chemicals both at home (e.g., radon) and at work (e.g., waste site cleanup). This research will emphasize the development of biological markers of exposure and susceptibility that will form the basis for the future development of individualized risk estimates, as well as retrospective analyses of environmental or occupational exposures to energy-related radiation and chemicals. The subprogram conducts research that utilizes the unique resources and tools developed in the Department's radiation biology, human genome, and cellular and molecular biology programs.

The FY 1996 Operating Expense request for the General Life Sciences subprogram is $113.6 million. Within this request, $70.0 million is requested for human genome research. Genome research will continue to emphasize the development and application of innovative, faster and more cost-effective approaches for determining the sequence of DNA subunits by integrating new instrumentation into sequencing systems, enhancing large-scale sequencing, improving linkages between biological databases that support sequencing and mapping, and expanding capabilities for interpreting DNA sequence information. Additional effort will be applied to facilitating transfer of technologies into the private sector. We will continue to address ethical, legal, and social ramifications of using information from the program, with emphasis on those issues related to the privacy and confidentiality of genetic information.

The General Life Sciences Operating Expenses request includes $22.4 million for structural biology activities, including increased funding for staffing and technical support of user resource centers for the U.S. scientific community at the Department's synchrotron and neutron beam facilities, and for a training program for new users of these facilities. The request provides for new research in computational biology that will couple advances in structural biology and genome research with information technologies as the first step toward developing a national information infrastructure for biology. This infrastructure will facilitate progress in biotechnology and the translation of basic research to medical applications. The request also supports molecular and cellular biology research to apply technology developed for human genome research to gain an understanding of genetic factors that determine an individual's susceptibility to adverse health risks from exposure to energy-related materials, to develop new and modified biomolecules of potential significance for biotechnology, and to study the basic genetics of industrially important microorganisms.

Within the $38.9 million request for the Medical Applications subprogram, research in molecular nuclear medicine will provide significant insight into the mechanisms of macromolecular interactions underlying normal genetic, cellular, and physiological processes. Nuclear Medicine research has contributed significantly to advances in the use of Positron Emission Tomography and Single Photon Emission Computer Tomography for *in vivo* quantitative estimates of perfusion, metabolism, and concentrations of radiopharmaceutical docking stations for biochemical interactions in living subjects. Building on the historic achievements of the DOE program in the area of medical applications, and using the modern tools from molecular biology, genome, and structural biology, the program will foster a new generation of novel techniques and instruments as a beginning step toward revolutionary advances in diagnosis and treatment. The goals are to develop new radioisotopic molecular approaches and highly sensitive radionuclide imaging tools to study the molecular biology of normal cell and human disease *in vivo*. In Boron Neutron Capture Therapy research, two Phase I clinical trials have been approved by the Food and Drug Administration (FDA) and are now in progress using recently developed boron-labeled compounds that have significantly better biodistribution to tumors than earlier materials. An application to advance to Phase II trials with brain cancer patients has been submitted to the FDA.

The FY 1996 Operating Expenses request of $50.1 million for Environmental Research supports the Department's strong commitment to strategic research that addresses energy-related environmental issues, including terrestrial research, microbial genome research for waste cleanup, ocean margins research, atmospheric sciences research, and ecosystems research.

Terrestrial Research will focus on the processes that influence the transport and fate of contaminants from defense facilities and energy-related wastes. This will include research on immobilizing and transforming contaminant plumes in different soils and climatic conditions using in situ microbial and other methods. These efforts will continue to be carried out in collaboration with the Offices of Environmental Management, Defense Programs, and other program offices to leverage financial resources and to develop cost-effective and efficient in situ technologies for remediating contaminated environments.

Understanding the basic physical, chemical, and microbiological mechanisms that control the reactions of organics, heavy metals, and radionuclides will provide a basis for new cleanup technologies, and extend national leadership in biotechnology. Exploiting the capabilities and the technologies of the human genome and structural biology programs, research will continue to develop DNA sequence information necessary to understand, manipulate, and engineer industrial and environmentally important microorganisms.

Ocean margins research in FY 1996 will include field experiments that apply molecular biological procedures to improve understanding of biogeochemical processes and the mechanisms that drive the cycling of carbon on the continental shelves. This research will improve understanding of carbon exchanges between continental shelves and the open ocean and other potential sinks.

Atmospheric sciences research will focus on the analysis of recent field experiments to understand the transport, dispersion, and ultimate fate of energy-related agents, with emphasis on chemical processes related to the production and destruction of ozone.

Environmental Research will also support research directed at understanding ecosystem responses to environmental changes. This includes basic biological and ecological research to quantify ecosystem responses resulting from atmospheric and climate changes. This research will define the vulnerability of ecological systems to global changes and the need to mitigate or enhance adaptation to such changes. Research in FY 1996 will focus on the biological and ecological mechanisms that control the observed responses that determine the rates and magnitude of the responses to environmental changes. The research is being carried out in a cooperative mode with other National Science and Technology Committee participants via common solicitations and common peer reviews.

The FY 1996 Operating Expenses request for Carbon Dioxide Research is $88.4 million. These funds are required for research to predict the future atmospheric concentrations of carbon dioxide and other energy-related greenhouse gases, to predict the rate and magnitude of potential climate change, and to understand and predict the impact of emissions and climate change on ecosystems and human systems. Two of the major elements of this program are the Atmospheric Radiation Measurement (ARM) program and the Computer Hardware Advanced Mathematics and Model Physics (CHAMMP) program. The ARM program is an experimental and modeling program that will improve how climate models describe important atmospheric processes, including the role of clouds, which scientists believe may be the key to the response of the climate system to increasing greenhouse gases. The FY 1996 request includes continued support of the first ARM site in the Southern Great Plains, phased implementation of the second in the Tropical Western Pacific, and planning for the third site in the North Slope of Alaska. The research involves a network of ground-based, remote sensing instruments to provide the data for process-oriented studies of climate change phenomena, including the development of miniaturized instruments for unmanned aerospace vehicles (UAVs) and limited test flights with leased UAVs.

CHAMMP is a strategic research program that seeks to improve the abilities of atmospheric and ocean circulation models to predict climatic response to increasing carbon dioxide and other greenhouse gases in the atmosphere. The program is contributing to coupled atmospheric and ocean climate models capable of running 100 times faster than 1990 vintage models through software using parallel processing and improved mathematical formulations. Fiscal Year 1996 activity will continue to focus on these supercomputer simulations and on continued improvements in the spatial resolution of climate models for decade and longer-term climate predictions.

The FY 1996 request for Carbon Dioxide Research would also support research on terrestrial carbon processes; continue the internationally acclaimed research on global climate model diagnostics; and support the National Institute for Global Environmental Change (NIGEC) and the six NIGEC Regional Centers that are supporting research on the regional consequences of global climate change. It would maintain fellowships and scholarships at universities and the national laboratories in global change research; continue the global survey of carbon dioxide in the world's oceans; and support integrated assessment and economics research to study the impact of climate change on various potential energy sources. The ocean and terrestrial carbon research will elucidate uncertainties of the global carbon cycle, including the unaccounted for carbon dioxide emitted to the atmosphere and the unexpected slowdown in the rate of increase of atmospheric carbon dioxide concentrations.

The FY 1996 Operating Expense request includes $8.9 million for the Analytical Technology subprogram. This subprogram will focus on new and improved instrumentation for single cell imaging and analysis to study potential health impacts of energy related radiation and chemicals and to evaluate damage to phytoplankton populations in the oceans. New microsensor technology for detection of hazardous substances in the environment will continue to be developed.

Budget Authority in Millions

Energy Supply R&D - Biological and Environmental Research (Construction Summary)	TEC	FY 1995	FY 1996 Request
- Structural Biology Support Facilities, LBL (94-E-337)	7.9	4.7	2.6
- Structural Biology Ceter, ANL (94-E-338)	14.9	6.7	4.3
- Human Genome Laboratory, LBL (94-E-339)	24.6	15.8	5.7
- Environmental and Molecular Sciences Laboratory (91-EM-100)	207.9	40.0	50.0
- General Plant Projects (GPE-120)	N/A	3.5	4.5
Total Biological and Environmental Research Construction		$ 70.7	$ 67.1

The FY 1996 request for Program Direction is $7.6 million. These funds are required for the salaries, benefits, travel, and other expenses associated with 62 full-time equivalents required to administer the BER program.

The Capital Equipment request of $24.0 million is required to support replacement of deteriorated and obsolete equipment at the laboratories and to acquire new, state-of-the-art equipment, particularly for human genome, structural biology, and carbon dioxide research. The request also provides essential equipment for ARM, including equipment for UAVs.

As indicated above, the FY 1996 Construction request for BER is $67.1 million. This includes $50.0 million to continue construction of the Environmental Molecular Sciences Laboratory (EMSL) at Pacific Northwest Laboratory. The EMSL will provide a state-of-the-art user facility and research center to conduct research on molecular science issues in geochemistry and biology which are particularly critical to the Department's environmental restoration mission. Another $5.7 million in Construction funding is requested for continuation of the Human Genome Laboratory project at Lawrence Berkeley Laboratory. This project will provide a state-of-the-art facility for carrying out interdisciplinary human genome research. The request also includes $4.3 million for a Structural Biology Center at Argonne National Laboratory and $2.6 million for the Advanced Light Source Structural Biology Support Facility at Lawrence Berkeley Laboratory. Also included in the request is $4.5 million for General Plant Projects that are necessary to keep the general plant of the laboratories (e.g., buildings, roads, and utilities) in good operating condition.

LABORATORY TECHNOLOGY TRANSFER
(FY 95 - $56.6M -- FY 96 - $58.8M)

Based on progress to date, there is a reasonable prospect for recapturing up to 50% of business lost to imports over the past decades, through the AMTEX^{TM} partnership between the U.S. Textile industry and the Department, resulting in the creation of 250,000 jobs in the next 10 years.

The Laboratory Technology Transfer program supports leveraged collaborations with U.S. industry in laboratory core competency areas relevant to industry needs. This industrial collaboration research and development program supports quick response technology deployment projects with emphasis on small and minority businesses, Cooperative Research and Development Agreements (CRADAs), and major industry-driven partnerships such as the AMTEX^{TM} partnership with the textile industry. Program activity is focused in technology areas where respective laboratory core competencies are strongest.

The program continues to leverage government funds with private sector funds, and has, to date, averaged an industry cost share of 50 percent. Cost sharing by industry participants for projects, an essential component of technology collaborations, ensures that industry is committed to commercializing the technology under development and helps strengthen the laboratory core competency areas.

In FY 1995, the program (1) continued support for the AMTEX^{TM} partnership; (2) initiated support for the Advanced Computational Technology Initiative (ACTI); (3) initiated 61 new multiyear CRADAs; (4) fully implemented block funding to the Energy Research laboratories which allows them to select projects which meet the real time needs of industry; and (5) streamlined the CRADA project selection process, resulting in a processing time reduction of approximately 50 percent.

FY 1996 BUDGET REQUEST FOR LABORATORY TECHNOLOGY TRANSFER

Budget Authority in Millions

Energy Supply R&D - Laboratory Technology Transfer	FY 1994	FY 1995	FY 1996 Request
Operating Expenses -*Lab Technology Transfer*	36.4	55.9	58.8
Operating Expenses -*Technology Utilization*	1.0	1.0	0.0*
Subtotal Technology Transfer	37.4	56.9	58.8
Less General Reduction for Use of Prior	- 0.7	- 0.3	-
Total Technology Transfer	$ 36.7	$ 56.6	$ 58.8

* *Technology Utilization has been transferred to a new program under the Deputy Under Secretary for Technology Partnerships and Economic Competitiveness.*

The FY 1996 budget request of $58.8 million for the Laboratory Technology Transfer program will support continuation of 110 ongoing multiyear CRADAs, the AMTEX^{TM} partnership, and small projects at Energy Research laboratories, particularly with small businesses. The latter include technology maturation projects, personnel exchanges, technical assistance/consultation, and small CRADAs. In addition, the request will support the ACTI partnership at the same level and will initiate participation in the Partnership for New Generation Vehicles.

ENERGY RESEARCH ANALYSES
(FY 95 - $3.5M -- FY 96 - $3.4M)

The mission of the Energy Research Analyses program is to conduct technical assessments of the Department's civilian research and development programs and to provide direction to future research and development activities. During the past year, senior research managers within the Department, seeking to enhance the quality of their programs, have requested comprehensive project-by-project evaluations of research programs in the areas of solar photochemistry and fossil energy advanced research. Highly specific findings from these reviews provided managers with the authoritative information they needed to modify and improve their programs. Energy Research Analyses also conducted state-of-the-science assessments and research needs assessments on special topics of interest to senior managers across the Department. Support is provided for planning, science policy analyses, and development of basic science strategic plans.

The FY 1996 budget request of $3.4 million will provide funding for one technical assessment of programs either in the Office of Energy Research or another Department office. Research and development projects currently in progress across the Department will be carefully peer reviewed by drawing upon leading experts. Assessments of special topics of interest to Department of Energy senior managers will also be conducted.

MULTIPROGRAM ENERGY LABORATORIES-FACILITIES SUPPORT

(FY 95 - $41.6M -- FY 96 - $51M)

In many research areas, U.S. industry relies heavily upon the Department's facilities to conduct experiments that would otherwise be too expensive, or even impossible, to carry out in the United States.

The Multiprogram Energy Laboratories-Facilities Support (MEL-FS) program addresses the general purpose infrastructure needs at the five multiprogram energy laboratories and the Oak Ridge Institute for Science and Education. The five multiprogram energy laboratories are: Argonne National Laboratory-East, Brookhaven National Laboratory, Lawrence Berkeley Laboratory, Oak Ridge National Laboratory, and Pacific Northwest Laboratory. These laboratories have an average age of 30 years and have an estimated replacement value of over $10 billion.

Fulfillment of the science and technology goals and objectives identified in the Department's Strategic Plan depends heavily on the existence and operating efficiency of these multiprogram laboratories. However, much of the infrastructure of these laboratories is old, deteriorating, and obsolete and needs improvement to comply fully with the environment, safety and health requirements in effect today and to meet operational needs.

The MEL-FS program is designed to preserve the government's investment in infrastructure and to maintain infrastructure integrity in a reasonable and economic manner at these laboratories. The program has three subprograms: General Purpose Facilities (GPF); Environment, Safety and Health (ES&H) Support; and Inactive and Surplus Facilities. These subprograms help to ensure that the infrastructure of the laboratories is adequate to support the Department's missions now and into the future. The FY 1996 budget request for MEL-FS in $51.0 million.

The GPF subprogram supports line-item construction to rehabilitate and replace general purpose infrastructure and provides operating funds to support facilities planning and management activities. This subprogram also includes funding for General Plant Projects (GPP) and General Purpose Equipment (GPE) at Oak Ridge National Laboratory and the Oak Ridge Institute for Science and Education. The FY 1996 request for GPF is $21.2 million for Construction, which provides for GPP funding as well as the completion/continuation of six ongoing line-item projects; there are no new construction starts in FY 1996. An additional $0.6 million is requested for Operating Expenses for related facilities planning and management and $5.8 million is requested for Capital Equipment.

Energy Supply R&D -- Multiprogram Energy Laboratories - Facility Support	FY 1994	FY 1995	FY 1996 Request
- General Purpose Facilities	32.9	28.2	27.6
- Environment, Saftey and Health	6.7	14.3	22.9
- Inactive and Surplus Facilities	0.5	0.5	0.5
MEL-FS Subtotal	40.1	43.0	51.0
- Less General Reduction	- 0.8	- 1.4	-
Total Multiprogram Energy Laboratories - Facility Support	$39.3	$ 41.6	$ 51.0

A more detailed budget table for Multiprogram Energy Laboratories - Facility Support is provided in Appendix II-E.

The ES&H Support subprogram continues to support necessary site-wide ES&H actions identified in the Department of Energy Environment, Safety and Health Management Plan. The FY 1996 request is $22.9 million. The increase above the FY 1995 level of $8.6 million is based on needs identified and prioritized in the DOE ES&H Management Plan. The request includes $8.2 million for ES&H Operating Expenses to support the highest priority corrective actions and compliance issues. The Construction request of $14.2 million would provide for completion/continuation of six ongoing projects and initiation of three new projects. The three new line-item projects are: the Building Electrical Service at Argonne National Laboratory-East; Building 801 Renovations at Brookhaven National Laboratory; and the Sanitary Sewer Restoration at Lawrence Berkeley Laboratory. The request also includes $0.5 million for ES&H-related Capital Equipment.

The FY 1996 request for the Inactive and Surplus Facilities subprogram is $0.5 million. It will provide for cleanup, removal, or preparation for transfer of such facilities to DOE's Office of Environmental Management for decontamination and decommissioning. A backlog of inactive and surplus facilities at the laboratories has accumulated over the years as missions, programs, and technologies have changed. Actions are prioritized based on the estimated surveillance and maintenance cost reductions, the reduction of ES&H liabilities, and site/facility reuse potential.

ADVISORY & OVERSIGHT PROGRAM DIRECTION AND POLICY & MANAGEMENT

(FY 95 - $14.7M -- FY 96 - $12.0M)

The FY 1996 budget request for Advisory and Oversight Program Direction is $9.8 million. The request will provide the salaries, benefits, travel, and other expenses associated with 79 full-time equivalents required to carry out my responsibilities as Director of Energy Research under legislation (P.L. 95-91), and also those assigned or delegated by the Secretary in areas beyond the scope of other ongoing Energy Research programs.

This program supports the staff in the Office of Energy Research who assist me in carrying out my statutory responsibilities to provide advice and analyses to the Secretary on science and technology issues. They provide advice on Department of Energy scientific and technology plans, programs, and policies; develop and assess policies designed to ensure the overall strength and vitality of the multiprogram laboratory system including infrastructure resource management activities; and manage the Energy Research Laboratory Technology Transfer program.

This program also funds staff in Energy Research's Office of Environment, Safety and Health Technical Support. This Office is responsible for providing crucial environmental, safety and health support and guidance to Energy Research's highly complex scientific programs.

The FY 1996 request for Policy and Management is $2.2 million. These funds are required to provide for the salaries and related expenses associated with 18 full-time equivalents who provide overall management direction in the immediate Office of the Director of Energy Research.

I would now like to discuss our programs under the General Science and Research appropriation. These include the High Energy Physics and the Nuclear Physics programs.

HIGH ENERGY PHYSICS

(FY 95 - $642.1M -- FY 96 - $685.6M)

In 1994, Scientists supported by the Department have obtained experimental evidence for the existence of the "Top Quark", providing verification of the Standard Model, a greatly simplified picture of the physical world at its most fundamental level.

The High Energy Physics budget request includes $15 million of the $100 million for the Science Facilities Initiative. High Energy Physics research is directed at understanding the nature of matter and energy at the most fundamental level, as well as the basic forces which govern all processes in nature. This fundamental research not only helps us learn how the world works; it also contributes to the Nation's competitiveness in the marketplace. Each bit of new knowledge gained provides new ways of looking at the universe which lead to new possibilities of direct benefit to mankind. The pursuit of high energy physics research requires accelerators and detectors utilizing state-of-the-art technologies in many areas, including fast electronics, high speed computing, superconducting magnets, and high power radiofrequency devices. In these areas, high energy physics research frequently drives the technology, which has led to many practical applications in the civilian marketplace. Furthermore, by working with various industries to develop state-of-the-art equipment, research physicists directly help to improve industrial processes and speed new technology to the marketplace. High energy physics also continues to make major contributions to accelerator technology and provide technical expertise to support the widespread utilization of accelerators in other scientific disciplines and in industrial processes such as synchrotron light sources and medical diagnostics and treatment.

The High Energy Physics program has and continues to provide an excellent education to the best and brightest young scientific minds, which allows the program to continue to expand its frontier capabilities. Experimental and theoretical researchers from over 100 universities conduct about three-fourths of this research, with the remaining scientists coming from the national laboratories. These highly skilled scientists and engineers often contribute significantly to the transfer of technology to other fields. In addition, one of the program's best legacies is that more than half of its Ph.D.'s ultimately go into industry, where they find that the broad basic physics training essential to particle physics stands them in good stead.

The Department of Energy provides approximately 90% of the Federal support for the Nation's high energy physics (also called elementary particle physics) research. Our knowledge of the universe, the fundamental constituents of matter, and the laws of nature that underlie all physical processes continues to grow as a result of this research. The past two decades have shown much progress in understanding the ultimate structure of matter. Experimental discoveries, theoretical insights, and technological innovations continue to lead us toward a unified understanding of matter and energy. The results of this work show a greatly simplified picture of the physical world at its most fundamental level, as contained in the Standard Model, the prevailing theory of the particles and forces that determine the fundamental nature of matter and energy. Although much progress has been made, fundamental questions still are unanswered. For example, have we discovered the ultimate constituents of matter? Are there smaller particles inside the families of particles called leptons and quarks that we currently believe are the fundamental particles? Have all the forces of nature been identified, and are there new kinds of energy sources?

These and other challenging questions are explored by high energy physicists through an interplay of experimental research using accelerators and detectors, and through theoretical studies. Scientists use large particle accelerators to fire subatomic particles at one another or into a fixed target at nearly the speed of light. These collisions are registered and recorded by huge state-of-the-art electronic devices, called detectors, which transmit the information to computers for subsequent evaluation and analysis.

Carrying out this research effectively depends on many factors, including the experimental capabilities, effective use of facilities, and the provision of upgraded and new facilities on a timely basis to take advantage of new technologies and research opportunities. In the U.S., the Department of Energy supports three major high energy physics accelerator centers: the Fermi National Accelerator Laboratory (Fermilab), the Stanford Linear Accelerator Center (SLAC), and the Alternating Gradient Synchrotron (AGS) at Brookhaven National Laboratory. Each of these centers provides unique capabilities and is operated as a national facility available to qualified experimenters from around the world on the basis of the scientific merit of their research proposals. Approximately 2,000 scientists use U.S. high energy physics facilities, and about 200-300 visiting foreign scientists are working at these facilities at any given time.

Fermilab is home to the world's first and highest energy superconducting accelerator, the Tevatron. The Tevatron accelerates protons and antiprotons to an energy of 900 billion electron volts, and provides either a fixed target or a colliding beam research program. The Tevatron colliding beam research program benefits from having two major detector facilities in operation, the D-Zero Detector and the Collider Detector at Fermilab (CDF). These two detectors complement one another in their differing technical emphases on which types of particles they detect, and with what precision. In April 1994, Fermilab announced the first direct evidence for the long-sought sixth quark, called the top quark. The existing evidence points to a top quark with a mass of about 175 billion electron volts--a mass much heavier than had been expected almost two decades ago when the fifth quark (b-quark) was discovered. Definitive confirmation of its existence will require additional data, some of which may be obtained from the ongoing collider operating period. The search will be further enhanced by the recent new world record in the brightness or luminosity of the Tevatron antiproton-proton colliding beams, which substantially exceeded the previous world record set at Fermilab just a year ago. The new record is the result of full implementation of the Linac Upgrade project, plus several months of precision tuning of the 1,000 superconducting magnets in the accelerator. This latest luminosity, over ten times the design intensity of the original Tevatron project of ten years ago, may provide the additional data needed to confirm fully the top quark's existence and to measure its properties. Scientists are eager to find and study the top quark, since its existence would strongly support the Standard Model; and direct knowledge of its mass is a key to other theoretical predictions.

Construction of the Fermilab Main Injector Project is progressing on schedule toward completion in 1999, and within estimated costs. By providing a five-fold increase in the intensity of antiproton-proton collisions, this project will greatly enhance the physics capabilities of the Tevatron accelerator complex and its detector facilities by the end of the decade, and hence greatly increase the likelihood for major new scientific discoveries early in the next century.

At SLAC, the Stanford Linear Collider (SLC) is the world's only operating high energy linear collider. The SLC continues to collect data using its beam of polarized electrons, a capability unique to the SLC. In these experiments, a high energy beam of polarized electrons, which spin in alignment with the beam axis, collides with an unpolarized beam of positrons (the electron's antimatter counterpart) to produce what are referred to as Z particles, the heaviest known elementary particles. This unique polarized beam capability gives physicists an added degree of control over the experimental conditions. Studies of collisions involving polarized electrons provide important information about their interaction with positrons which is not otherwise easily available. More than 100,000 Z particles were observed and recorded by the SLAC Large Detector (SLD) during FY 1994. So far in FY 1995, over 60,000 Z's have been recorded. In fact, one of the critical parameters of the Standard Model has been measured by the SLD more accurately than by any other single experiment, the crucial parameter that determines the degree of mixing between the weak and electromagnetic forces in the Standard Model. As a result, the SLC is continuing to produce first-class scientific results that are competitive with those produced by other laboratories around the world. Additionally, the spin of the proton has been described in terms of its quark constituents through experiments at SLAC and the European Center for Particle Research (CERN).

Construction of the B-factory project began at SLAC in FY 1994 as part of the President's Investment Initiatives. The B-factory, which is scheduled for completion in 1998, will provide a high luminosity, asymmetric electron-positron colliding beam facility for study of violation of charge/parity conservation, or CP violation. CP violation is a fundamental symmetry-breaking process that is believed to be responsible for our very existence. Without it, the equal amounts of matter and antimatter that it is thought were formed at the origin of the universe might by now have come together and been annihilated. The project is being designed and built by SLAC in collaboration with Lawrence Berkeley Laboratory, Lawrence Livermore National Laboratory, and other research institutions.

The long-term future of research using electron-positron colliders is being studied at sites around the world. These devices require extraordinarily small beams; SLAC is conducting research and development experiments which have provided the smallest diameter high energy particle beam ever seen. Equipment for these research and development experiments has been assembled at SLAC through an international collaborative effort involving the U.S., Russian Federation, Japan, France, and Germany. The first production of these tiniest beams occurred in FY 1994, and efforts to make them smaller continue.

At the AGS at Brookhaven, the new Booster was fully integrated into the accelerator complex in 1993, and the AGS delivered protons to 10 running experiments and 30 different test beam groups. In addition, its injector linac provided beams for testing materials for the production of radiopharmaceutical isotopes. The Booster has increased beam intensities by a factor of 4, to 4×10^{13} protons per pulse, and one pulse every 4 seconds. Such intensities set new world records. AGS scientists, continuing to study certain very rare ways (or modes) of how particles called kaons decay, are well into a multiyear experiment armed with a more intense kaon beam and an upgraded detector. These improvements have brought the team closer to a goal of processing a trillion positively charged kaons during a single run. The team is mainly searching for a particular decay mode in which a kaon would decay into specific particles: a positively charged pion, a neutrino, and an antineutrino. The Standard Model makes a definite prediction for the fraction of kaons decaying by this mode and, thus, its observation would further verify the Standard Model, refine its physical parameters, and probe the behavior of matter and forces at ultrahigh energies.

As part of the broad international collaboration and cooperation in high energy physics, U.S. physicists are substantially involved in all four experiments (ALEPH, DELPHI, L3, and OPAL) at the Large Electron-Positron collider at the CERN Laboratory in Geneva, Switzerland. Together, these four experiments have recorded over two million events involving the formation and decay of the Z particle; work to date has led to precise determination of parameters of the electroweak interaction. In addition, U.S. physicists are involved in both experiments (ZEUS and H1) at the Hadron Electron Ring Accelerator (HERA) at the DESY Laboratory in Hamburg, Germany, to gain deep insight into the structure of protons and neutrons.

The future of the U.S. high energy physics program was dramatically altered as a result of the termination of the Superconducting Super Collider (SSC). In addition, the cancellation of the SSC was preceded by several years of constrained budgets for the base high energy physics program. This situation raised many questions about the future of U.S. high energy physics research, and in November 1993, the Department requested that the High Energy Physics Advisory Panel (HEPAP) convene a Subpanel to assess the current program and make recommendations for the future. A HEPAP Subpanel on Vision for the Future of High Energy Physics, chaired by Dr. Sidney Drell, issued a report in May 1994. The report concluded that the current complement of U.S. accelerator facilities is world class. Further, with the completion of scheduled upgrades, it will remain so throughout the coming decade, thus providing university students, faculty, and national laboratory physicists with access to energy frontiers and the potential to make significant discoveries during this time period. The report made it clear, however, that in order to keep the U.S. high energy physics program vital and world class beyond this horizon, funding would need to be restored to the base program and a facility capable of advancing the energy frontier would need to be made available.

The Panel's recommendations outlined a program for maintaining U.S. leadership in international high energy physics research, for productive use of existing domestic facilities and for significant U.S. participation in the Large Hadron Collider project which has been proposed for construction at CERN.

The Department of Energy accepts the basic recommendations of the Drell Subpanel Report and believes they represent a balanced approach to maintaining the health and vitality of the current U.S. program, while at the same time advancing it to the next energy frontier. Therefore, we have requested a level of funding in FY 1996 that will accomplish the goals set forth in the Drell Subpanel Report. In particular, these funds will allow the Department to begin restoring the base program by increasing accelerator operating times at the laboratories, maintaining schedules for current upgrades, providing additional support for university groups, and strengthening technology R&D. In addition, these funds will allow us to begin initial work on experiments to be run on the Large Hadron Collider (LHC) at CERN.

U. S. physicists have shown their strong interest in participating in two major detector collaborations at the LHC and in magnet/accelerator research and development collaborations. CERN would welcome U.S. participation, and international collaboration on this large science project would greatly benefit both the U.S. and CERN. U.S. participation would allow CERN to finish the project at full operating capacity (14 tera electron volts (TeV), versus 10 TeV) in the year 2005 instead of 2008.

The benefits to the U.S. would be extraordinary. U.S. physicists would have continued access to the energy frontier at what will then be the highest energy accelerator in the world. It would ensure continued world class excellence of our university and national laboratory scientists and would provide training to many students in leading edge science and technology. In addition, most of the money the U.S. would spend on LHC detector and accelerator components would be spent in the U.S., with much of it going to industry to build these components. This would improve the capabilities and expertise of participating U.S. scientists and industries and would ensure their access to the high level technology being developed. The LHC also provides an excellent showcase to the European Common Market for U.S. high tech industrial capabilities.

An Interagency Working Group, which I chair, has been established to lay the framework for future discussions and support negotiations with CERN regarding U.S. participation in the LHC. We anticipate that representatives from CERN will visit the Department in the next few months to begin to develop the basis for an agreement. Of course, we will want to obtain your views on this matter.

FY 1996 HIGH ENERGY PHYSICS BUDGET REQUEST

Budget Authority in Millions

General Science And Research - High Energy Physics	FY 1994	FY 1995	FY 1996 Request
Operating Expenses	463.8	474.7	494.8
Capital Equipment	60.1	57.7	63.2
Construction	86.3	109.7	127.6
Total High Energy Physics	$ 610.2	$ 642.1	$ 685.6

A more detailed budget table for High Energy Physics is provided in Appendix II-F.

The FY 1996 budget request for High Energy Physics is $685.6 million. Of the total amount, $494.8 million is for Operating Expenses, $63.2 million is for Capital Equipment, and $127.6 million is for Construction.

The Operating Expenses request of $494.8 million provides for the continued participation of both experimental and theoretical university and National Laboratory scientists and students who are critical to the success of the High Energy Physics program, as well as for the operation of the High Energy Physics accelerators: the SLC, the Tevatron accelerator/collider, and the AGS. Priority will be given to the analysis of existing data and data collection at these facilities. The Tevatron collider in FY 1996 will shift to fixed-target operations following the long collider run in FY 1994 and 1995.

Physics research at SLAC will continue to emphasize use of the polarized electron beam capability of the Stanford Linear Collider and the Stanford Large Detector with the highest possible beam luminosity and polarization. We anticipate that more than 120,000 polarized Z's will be recorded in FY 1996. In parallel, SLAC will continue physics research using fixed targets at the end of the linac, as well as research and development for the B-factory and for the next generation of very high energy electron-positron linear colliders.

The recently commissioned AGS Accumulator/Booster has improved the performance and capabilities of the AGS, which has significantly increased the data collection rate for the experimental program. In FY 1996, the AGS will continue research on direct tests of the Standard Model through detailed study of rare decay modes of kaons. These and other studies will continue to provide experimental results for comparison with the Standard Model.

The FY 1996 Operating Expenses request also includes funding to support long-range accelerator and detector research and development to develop the new concepts and technologies that are essential to the efficient operation, continued enhancement, and extension of accelerator and detector capabilities.

The FY 1996 Capital Equipment request of $63.2 million will provide the particle beam-line components, detection apparatus, and data analysis systems essential to conduct forefront high energy physics research. In FY 1996, priority will be given to upgrading the CDF and D-Zero detectors at Fermilab and to the B-Factory detector at SLAC.

The FY 1996 Construction request of $127.6 million includes $52.0 million for continuation of the Fermilab Main Injector project. This project will greatly increase the numbers of protons and antiprotons that can be injected into the superconducting Tevatron, accelerated to world-record high energies, and brought into head-on collisions. This will further increase the research capabilities of the existing detector facilities at Fermilab. In particular, the first experimental observation of the long-sought top quark predicted by the Standard Model will be very likely, or its nonexistence in the predicted mass range will be demonstrated, thus showing the way toward modifying the Standard Model. The FY 1996 request will provide for completion of the Main Injector ring enclosure. About 40 percent of the dipole magnets will be procured (in addition to the one third already on hand) and power supply construction work will be completed.

Budget Authority in Millions

General Science and Research - High Energy Physics (Construction Summary)	TEC	FY 1995	FY 1996 Request
- Fermilab Main Injector (92-G-302)	229.6	43.0	52.0
- B- Factory (94-G-304)	117.0	44.0	52.0
- Accelerator Improvements and Modifications (95-G-301)	N/A	10.6	9.8
- General Plant Projects (GPE-103)	N/A	12.1	13.8
Total High Energy Physics Construction		109.7	127.6

The FY 1996 Construction request also includes $52.0 million to continue construction of the B-factory at SLAC to provide for an asymmetric, very high luminosity electron-positron collider. The B-factory will collide ultrahigh intensity beams of electrons and positrons to create tens of millions of subatomic particles called B mesons. Detailed studies of the properties of these particles will help scientists explain why the universe now consists of matter when shortly after the beginning of the universe, matter and antimatter almost certainly existed in equal proportion. This is one of the most fundamental questions of elementary particle physics.

The Construction request also provides $9.8 million for Accelerator Improvements and Modifications (AIM) and $13.8 million for General Plant Projects. AIM projects provide for improvements to research accelerators and related experimental facilities, while General Plant Projects address the need to upgrade general laboratory facilities. These projects are needed to maintain the scientific effectiveness, reliability, and efficiency of High Energy Physics facilities. The FY 1996 General Plant Project request provides additional funding for high priority ES&H projects.

NUCLEAR PHYSICS

(FY 95 - $331.5M -- FY 96 - $321.1M)

1994 saw rapidly growing interest in proton cancer therapy and the use of Department supported accelerator facilities by the "computer chip" industry.

The Nuclear Physics budget request includes $25 million of the $100 million for the Science Facilities Initiative. The primary goal of Nuclear Physics research is to understand the structure and properties of atomic nuclei and the fundamental forces between the constituents that form the nucleus. Nuclear processes determine essential physical characteristics of our universe and the composition of the matter which forms it. Because of the strong forces involved, such knowledge is essential for understanding the world around us. Nuclear physics is an area of basic research in which the U.S. maintains a position of world leadership.

Our Nuclear Physics program has a long tradition of developing and transferring of knowledge to enhance our technological and economic competitiveness in such fields as nuclear medicine and power generation. Nuclear medical procedures at U.S. hospitals alone constitute a billion dollar industry. Most of these technologies are mature and are conducted independently of the Nuclear Physics program, but vital interactions still occur. Current examples include the rapidly growing interest in proton cancer therapy and the use of Department of Energy (DOE)-supported accelerator facilities by the "computer chip" industry to develop improved microelectronic components.

The Nuclear Physics program continues to be a vital source of trained manpower for fundamental research and for these applied technology areas. The program supports the graduate training of approximately 450 students per year, and typically 100 Doctorates in nuclear physics are awarded each year at DOE-supported nuclear physics programs. A majority of these highly trained researchers will take positions in high-technology private industry.

The Nuclear Physics program provides 90 percent of the total support for the U.S. nuclear physics effort. The research is conducted by scientists and students at universities and national laboratories. To ensure a high quality program and continued focus on the highest scientific priorities, a major peer review was conducted in FY 1994. The intellectual challenges and diversity of the field require a variety of particle accelerators operated by the Nuclear Physics program at Argonne, Brookhaven, Los Alamos, Lawrence Berkeley, and Oak Ridge National Laboratories, and at the Massachusetts Institute of Technology (MIT). Experimental time is allocated to researchers at each of these laboratories on the basis of peer review of the scientific merit of the proposed work. Smaller accelerator facilities, dedicated to in-house research, are operated at Yale University, the University of Washington, Texas A&M University, and the Triangle University Nuclear Laboratory at Duke University. In addition, research is performed at High Energy Physics accelerators, National Science Foundation facilities, and foreign facilities.

In FY 1996, we will progress to the next generation of nuclear physics studies. At that time three new major facilities, the Continuous Electron Beam Accelerator Facility (CEBAF) in Newport News, Virginia, the Solar Neutrino Observatory at Sudbury, Ontario, Canada, and the Radioactive Ion Beam Facility at the Oak Ridge National Laboratory, will be available for research on the newest and highest priority areas of nuclear physics.

Over the last several years, the Nuclear Physics program has been restructuring to be able to make the best use of these new facilities. The BEVALAC facility at Berkeley has been closed and the Los Alamos Meson Physics Facility (LAMPF) is being transferred to Defense Programs for operation. A new Long Range Plan for the U.S. Nuclear Physics Program, prepared by the nuclear physics community, is being prepared to ensure that we can address the most pressing scientific questions.

What physics will the new facilities study? Until the last few years, the fundamental understanding of nuclear properties has been based on the idea of a nucleus composed of protons and neutrons which interact through a combination of weak, strong, and electromagnetic forces. It became clear that achieving a real knowledge of many nuclear properties depends on understanding nuclear structure based on quarks and particles (called gluons) which bind the quarks together. Strong evidence indicates that quarks and gluons are the building blocks of protons and neutrons. Nuclear physics studies offer unique ways to investigate and thus understand how nuclei, and thus the material of the universe, is built up from these minute components. Many of the next generation of nuclear physics investigations will study questions related to the quark presence in nuclei.

Such studies require ultra-high resolution "microscopes", accelerators which produce particle beams of very high energy and resolution. The CEBAF facility is such an accelerator. This successful construction project will be completed in FY 1995. Three separate, large, and fully instrumented experimental halls are planned for the laboratory. In FY 1995, the ability to provide beam simultaneously to all three halls will be demonstrated. In FY 1996, two of the three halls will be routinely available for experiments and 5,000 hours of beam will be available for experiments. A high priority experiment to be initiated in FY 1996 at CEBAF is a precise measurement of the distribution of electric charge within the neutron. Although the neutron is electrically neutral, the three quarks in the neutron are all charged, and a measurement of the charge distribution will shed light on how the quarks move within the neutron.

The early CEBAF experiments will be complemented by studies at the Bates accelerator at MIT and at high energy accelerators such as the Stanford Linear Accelerator (SLAC) in the U.S., the CERN facility in Geneva, Switzerland, and the DESY facility in Hamburg, Germany. Two principal focuses of these studies will be to continue to develop an understanding of how the "spin" of a nucleus originates in the quarks, and how the size of a quark cluster in a nucleus affects the strength of the interaction of that cluster with other nucleons (protons and neutrons) in the nucleus.

Research at CEBAF will study effects due to the presence of quarks in nucleons in the nucleus. However, no one has ever observed a single free quark; they always travel in closely knit groups of threes within nucleons. It is predicted that if a collection of nucleons (i.e., a nucleus) could be compressed and heated to a very high temperature, there would be a phase transition to a new state of nuclear matter in which the quarks are "freed" from their nucleon boundaries to form a so-called quark-gluon plasma. Such a heating and compression might occur when two large nuclei collide head-on at very high, relativistic energies. The quark-gluon plasma would simulate the plasma which is believed to have existed at the first instance of the creation of the universe. The creation of a quark-gluon plasma in the laboratory would provide a unique way of studying the underpinnings of the current Standard Model.

Such a quark-gluon plasma will be produced with the second major facility for the study of new "quark-based" nuclear physics, the Relativistic Heavy Ion Collider (RHIC) at the Brookhaven National Laboratory. RHIC is now under construction and will be completed in FY 1999. The first sextant of the RHIC accelerator will be completed in FY 1996 and initial tests of that part of the system will be conducted.

With the availability of RHIC and CEBAF, we will have a unique capability to study the fascinating possibilities of the quark-based model of nuclear matter. Some investigations leading to the possible formation of the quark-gluon plasma have already been initiated with heavy ion beams at CERN and at the Alternating Gradient Synchrotron (AGS) at Brookhaven National Laboratory; however, their energies are too low to complete the transition from hot dense nuclear matter to the quark-gluon plasma.

There are also exciting prospects in more traditional areas of nuclear physics, and another of the new generation facilities, the Radioactive Ion Beam (RIB) Facility at Oak Ridge National Laboratory, will address these areas. Much of the research activity will be related to questions of nuclear astrophysics. The chemical elements in the universe were created at various times in galactic history during the Big Bang and during the burning of stars. Our understanding of the relative abundances of these elements is still incomplete. Some of the most critical nuclear reactions in the stellar burning processes involve nuclei which, because of their short lifetimes, have not been available for laboratory studies.

The RIB will produce some of these previously unavailable nuclei so that these important stellar processes can be studied in the laboratory. The development of the project has benefitted greatly from the involvement of scientists from the United Kingdom, which has contributed the support equipment for RIB worth several million dollars. Beams for experiments will be available in FY 1996 and it will be possible for the first time to study many processes which are crucial to our understanding of how nuclei were synthesized in the Big Bang. In addition, studies of the structure of new nuclear isotopes at the limits where the nucleons can be bound together, even for a short time, is one of the major thrusts in nuclear physics studies in the world today. The new RIB facility will be used to make and determine the properties of many previously unavailable nuclei, far outside the body of stable and almost stable nuclei we have studied to date.

The third major new facility which will become operational in FY 1996 is the Solar Neutrino Observatory (SNO) in Canada. The project involves an international collaboration among the U.S., United Kingdom and Canada. The solar neutrino problem remains one of the great challenges in astrophysics. The predicted rate of neutrino production in the sun is significantly higher than the observed rate. Results from the ongoing experiment at the Soviet-American Gallium Experiment in Russia and from a second similar experiment, GALLEX, located in Italy, which both detect neutrinos from the primary solar burning process, are now consistent with each other and confirm that only 60 percent of the predicted neutrinos are observed. There are two possible explanations for the discrepancy. Either our understanding of solar burning is very wrong, or the neutrino has a small mass, in contradiction to the long-held belief that it is massless. Early in FY 1995, for the first time, a very precise calibration of the GALLEX experiment with a reactor-prepared neutrino source of known intensity was conducted. The calibration strongly confirmed the previously reported results at GALLEX. With the existing facilities, there is no way to discriminate between two possible origins of the discrepancy. The SNO facility is designed to sort out this longstanding problem, and data collection will start in FY 1996. The resolution of the problem is of major interest to both nuclear and high energy physics. It is important to note that the present Standard Model does not include the possibility for a neutrino with mass. Clearly, FY 1996 is a year of challenge and opportunity for important new studies in the field of nuclear physics.

FY 1996 NUCLEAR PHYSICS BUDGET REQUEST

Budget Authority in Millions

General Science And Research - Nuclear Physics	FY 1994	FY 1995	FY 1996 Request
- Operating Expenses	211.3	225.4	213.3
- Capital Equipment	32.0	28.0	28.0
- Construction	102.0	78.1	79.8
Total Nuclear Physics	$ 345.3	$331.5	$ 321.1

A more detailed budget table for Nuclear Physics is provided in Appendix II-G.

The FY 1996 budget request for the Nuclear Physics program is $321.1 million. Of that total, $213.3 million is for Operating Expenses, $28.0 million is for Capital Equipment, and $79.8 million is for Construction.

In FY 1996, several new and recently completed/upgraded research facilities will be available for research for the first time. The Operating Expenses request is designed to provide the maximum possible operating hours for these new facilities, so that researchers may take full advantage of their unique new capabilities. CEBAF will operate for 5,000 hours to permit the startup of several high priority experiments to study the quark presence in nuclei. The new Radioactive Ion Beam facility at the Oak Ridge National Laboratory will be operated for 3,100 hours for studies of nuclear measurements of astrophysical significance and for studies of very proton rich nuclei far from stability. The Gammasphere facility at Lawrence Berkeley Laboratory will operate for 5,360 hours for high resolution studies of superdeformed nuclei. The Bates Linear Electron Accelerator at the Massachusetts Institute of Technology will operate for 3,000 hours to take advantage of the new south hall ring facility.

No funds are requested for the operation of the LAMPF facility at Los Alamos National Laboratory. On the presumption that the facility will be operated by Defense Programs in FY 1996, research funds will be provided to Los Alamos to conduct high priority experiments at LAMPF. At the University of Washington, funding is provided to the Institute for Nuclear Theory which will continue forefront scientific programs and workshops involving the entire nuclear physics community.

The Capital Equipment request of $28.0 million is required for experiments at Brookhaven National Laboratory in preparation for the RHIC program, procurement of components for additional detectors at CEBAF, and maintenance of an overall level of instrumentation to use the national accelerator facilities and university facilities in an effective manner. These funds will provide such equipment as particle detection systems, data acquisition and analysis systems, and instrumentation to improve the performance of the accelerators. The Capital Equipment request also includes funds to complete Gammasphere and to augment the detector at SNO for detection of exotic neutrinos. Finally, the FY 1996 request will provide for general purpose equipment to meet the laboratory-wide needs at Lawrence Berkeley Laboratory.

The FY 1996 Construction request for Nuclear Physics is $79.8 million. Of that amount, $70.0 million is for construction of RHIC. Nuclear Science Advisory Committee and the National Research Council have both confirmed the importance of this facility, which will provide unprecedented opportunities to produce and study ultradense matter. The request is consistent with a funding profile which will meet the planned construction completion date of 1999. RHIC will be a unique, world-class facility with colliding beams that provide collision energies of 100 billion electron volts (GeV) per nucleon for heavy ions as massive as gold nuclei. The facility will provide the opportunity to form a quark-gluon plasma, creating conditions in the laboratory that are similar to those of the expanding universe microseconds after the Big Bang. The accelerator is being built in the existing circular tunnel at Brookhaven. Construction funds for FY 1996 will be used to continue procurement of the collider ring and detector components. A full system demonstration of the first sextant of the collider ring will be completed.

The CEBAF construction project will be completed in FY 1995, and no line item Construction funds are requested for that laboratory. The Construction request does include $5.0 million for Accelerator Improvements and Modifications and $4.8 million for General Plant Projects. These projects are needed to maintain Nuclear Physics facilities and to provide for general purpose projects at Lawrence Berkeley Laboratory and CEBAF.

Budget Authority in Millions

General Science and Research - Nuclear Physics (Construction Summary)	TEC	FY 1995	FY 1996 Request
- Continuous Electron Beam Accelerator Facility (87-R-203)	313.2	1.0	0.0
- Relativistic Heavy Ion Collider, BNL (91-G-300)	475.3	70.0	70.0
- Accelerator Improvements and Modifications (95-G-302)	N/A	3.2	5.0
- General Plant Projects (GPE-300)	N/A	3.9	4.8
Total Nuclear Physics Construction		78.1	79.8

GENERAL SCIENCE PROGRAM DIRECTION
(FY 95 - $10.4M -- FY 96 - $10.9M)

The FY 1996 budget request for General Science Program Direction is $10.9 million. These funds are required to provide for the salaries, benefits, travel, and other expenses associated with 89 full-time equivalents required to administer the High Energy Physics and Nuclear Physics programs by the Headquarters staff and those at the Department of Energy Operations Offices.

This concludes my statement. I would be happy to answer your questions.

APPENDIX I

SUPERCONDUCTING SUPER COLLIDER

The Superconducting Super Collider (SSC), a large proton-proton collider for basic scientific research, was under construction near Waxahachie, Texas. The SSC was designed to become the world's preeminent particle accelerator facility for high energy physics research. Research at the SSC was expected to answer questions about the ultimate constituents of matter and energy.

The project was terminated by Congress in 1993 when it passed the FY 1994 Energy and Water Appropriations Bill (P.L. 103-126). Included in this bill was $640 million for the orderly termination of the SSC.

In November 1993, the Department assigned responsibility for termination of the SSC to the Oak Ridge Operations Office (Oak Ridge), which reports to the Associate Deputy Secretary for Field Management, and the SSC Project Office was reassigned from the Office of Energy Research to Oak Ridge. The Department published a termination plan which is being implemented under the direction of the SSC Project Director. The termination plan is consistent with the FY 1994 appropriations legislation that terminated the SSC project. Consistent with the provisions of this legislation, DOE is: 1) terminating the SSC project in an orderly, cost-effective, environmentally sound, and safe manner; 2) developing a plan to maximize the value of the investment made in the project, including recommendations as to the feasibility of other uses of project assets; and 3) working closely with the employees and other interested parties to mitigate the impact of the termination.

Close-Out Status

A Settlement Agreement was signed by the Department and the State of Texas in November 1994, and a Closing, which implemented formal transfer of property to the Texas National Research Laboratory Commission (TNRLC), was held on December 1, 1994. A transition period in which DOE provided practical assistance to Texas during the property transfer ended on January 31, 1995. This was an important step in the termination process, a necessary ingredient for the swift, efficient, and environmentally sound termination of the project. The agreement resolves claims made by the State, thereby avoiding litigation, and provides the basis on which the use and value of existing Collider assets can be maximized. It provides for an equitable distribution of property between the Department and the State, taking into account the respective Federal and State investment in the project.

The SSC Termination continues to be on schedule and within the budget estimate for the defined termination scope. Major milestones have been accomplished as follows:

- Personnel demobilization has occurred ahead of schedule.
- Technical close-out activities are complete except for records disposition.

- Subcontract close-out activities are on schedule. Of the 20 major subcontracts terminated, 16 settlement proposals have been received, three are due in March 1995, and one proposal has been settled.
- Property dispositions were delayed pending the Texas Settlement but are expected to be completed in 1995.
- Initial site stabilization was completed on schedule and a program plan for site restoration was provided to Texas for comment in December 1994.
- Project definition studies for future on-site use of assets and DOE evaluation of these studies have been completed.

Funding Status

Including the $640 million provided in the FY 1994 appropriation and the FY 1993 uncosted obligations of $95.8 million, $735.8 million was available for termination. Negotiations between the Department and the State of Texas resulted in a settlement payment of $145 million to Texas and an escrow payment of $65 million for a total of $210 million leaving $525.8 million available for termination. The $65 million is to be a one-time payment to support construction and commissioning expenses of a Texas-proposed cancer treatment and research facility (Regional Medical Technology Center) to be built at the project site in Ellis County, Texas. The $65 million will be released from escrow when a determination is made that the facility meets the requirements for such a facility as prescribed in the Energy and Water Development Appropriations Act of 1995.

It presently appears that implementation of the settlement and the project termination process can be accomplished within existing SSC appropriations. However, there are still some risks in view of substantial uncertainties, especially regarding the close-out of large subcontracts and the outcome of potential litigation. The Department is making every effort to keep the termination costs within existing SSC appropriations. The Department does not anticipate making any special requests for additional appropriations to support termination or future potential uses of assets at the SSC site. The SSC termination activities continue to be on schedule and within the budget estimate.

There is an additional issue which is outside the defined scope of the termination project. A number of local entities are seeking payments from DOE to offset alleged negative impacts from the decision to terminate the project. The current total of such claims is approximately $30 million. The analysis of the claims is underway and no determination as to merit has yet been made.

The financial records as of December 31, 1994 are summarized as follows:

SSC FUNDS STATUS
(As of 12/31/94)

Activity	Amount ($ in millions)
FY 1994 Costs	$ 318
FY 1995 Costs (Oct. - Dec. 94)	$ 251
Remaining availability	$ 167
Total	$ 736

A more detailed budget table for the Superconducting Super Collider is included in Appendix II-H

Disposition of SSC Assets

Both the Department and the State of Texas have conducted studies of potential on-site uses of major SSC assets and facilities. The State, under a DOE grant for up to $6 million, conducted project definition studies in four areas of use: research in superconductivity and cryogenics; high-performance computing; a regional medical technology center; and Blackland Prairie restoration. The Department initiated a second set of project definition studies that focused on six other potential on-site uses of assets: scientific study of the velocity of light in a magnetic field; research on convection of cryogenic helium gas; geotechnical research facility; research and science education center; minority institution network; and regional industrial technology institute. The Department made awards to eleven institutions, mostly universities, for eight project definition studies. Reports from both sets of project definition studies were submitted to the Department in late October. They have been peer reviewed and used to determine the interest of Federal, State, and other funding agencies.

Several of the potential on-site activities, especially those related to education, the support of industry, and land uses, are primarily of State interest and will depend on State leadership and funding. In some cases, such as specific scientific experiments, the Federal government would be the logical source of funding. Any formal proposal for such activities will be handled by the Federal agencies using their standard peer review processes.

To maximize their value and usefulness, most of the remaining Department-owned equipment and assets are being made available to other departmental programs and projects, with highest priority given to the High Energy and Nuclear Physics programs. The Department has established a working group of experts whose members help in determining the procedure for equipment reallocation to these programs. The Department has reserved certain of the remaining DOE-owned equipment and assets that are critically needed for on-site activities. Decisions on the reserved equipment and assets will be made in April, taking into account the funding status of the proposed on-site activities.

The complex negotiations and detailed studies have necessarily taken time. The Department will continue to move judiciously to arrive at a reasoned and thoughtful set of recommendations. A report on maximizing the value of the investment made in the SSC is being prepared and will be sent to the Congress and the President in May 1995.

Personnel Status

The Superconducting Super Collider Laboratory (SSCL) total population, which includes Universities Research Association, Inc. (URA) and EG&G, Inc. employees, temporary employees, consultants, and on-site vendor representatives, has been reduced from 2,328 at the time of termination to 416 as of January 31, 1995. This number is projected to decrease to 364 by March 31, 1995, and to approximately 50 by the end of September 1995. This number will steadily decrease in FY 1996 with the SSCL on-site presence expected to end not later than September 1996.

In addition to the SSCL employees, there are currently 39 DOE employees at the site (down from 61 at the time of termination), 12 DOE support service contractor personnel, and 8 MK-Ferguson employees. MK-Ferguson is the contractor performing site restoration activities. These numbers are projected to decrease through FY 1995 and FY 1996 with the DOE presence also expected to end not later than September 1996.

In summary, we believe that SSC termination is proceeding satisfactorily and on schedule and that we are proceeding in a manner which will assure that we maximize the benefits of the Government's and the State's investment in the SSC.

Appendix II-A
Office of Energy Research
Summary by Program
Budget Authority ($ in millions)

Energy Supply Research and Development	FY 1994	FY 1995	FY 1996 Request
Basic Energy Sciences	$ 757.8	$ 733.9	$ 811.4
Advanced Neutron Source	16.2	20.8	0.0
Fusion Energy	328.6	368.4	366.0
Biological and Environmental Research	395.2	436.6	431.7
Laboratory Technology Transfer	37.4	56.9	58.8
Energy Research Analyses	3.7	3.5	3.4
Multiprogram Energy Laboratories-Facilities Support	40.1	43.0	51.0
Advisory and Oversight	13.4	12.5	9.8
Policy and Management	3.1	2.2	2.2
Subtotal	$1,595.5	$1,677.8	$1,734.3
General Science and Research			
High Energy Physics	$ 610.2	$ 642.1	$ 685.6
Superconducting Super Collider	640.0	0.0	0.0
Nuclear Physics	345.3	331.5	321.1
General Science Program Direction	9.0	10.4	10.9
Subtotal	$1,604.5	$ 984.0	$1,017.6
Subtotal	$3,200.0	$2,661.8	$2,751.9
Less General Reduction for Use of Prior Year Balances	-29.4	-18.8	-
Total	$3,170.6	$2,643.0	$2,751.9

Appendix II-B
Energy Supply R&D
Basic Energy Sciences
Budget Authority ($ in millions)

	FY 1994	FY 1995	FY 1996 Request
Operating Expenses			
Materials Sciences	$ 259.6	$ 272.3	$ 348.3
Chemical Sciences	158.9	159.6	181.6
Engineering and Geosciences	35.5	35.9	39.9
Advanced Energy Projects	10.7	10.8	12.0
Energy Biosciences	25.5	27.9	29.5
Applied Mathematical Sciences	99.1	108.1	108.7
Program Direction	9.1	9.9	10.0
Subtotal	$ 598.4	$ 624.5	$ 730.0
Capital Equipment	$ 43.5	$ 39.0	$ 57.0
Construction	115.9	70.4	24.4
Subtotal Basic Energy Sciences	$ 757.8	$ 733.9	$ 811.4
Less General Reduction for Use of Prior Year Balances	- 14.2	- 8.8	-
Total Basic Energy Sciences	$ 743.6	$ 725.1	$ 811.4

Appendix II-C
Energy Supply R&D
Fusion Energy
Budget Authority ($ in millions)

	TEC	FY 1994	FY 1995	FY 1996 Request
Operating Expenses				
Confinement Systems		$ 163.2	$ 187.8	$ 131.5
Applied Plasma Physics		57.2	54.3	48.8
Development and Technology		78.0	89.0	100.4
Planning and Projects		0.0	7.4	6.0
Inertial Fusion Energy		3.9	8.0	3.1
Program Direction		8.9	9.6	9.6
Subtotal		$ 311.2	$ 356.1	$ 299.4
Capital Equipment		$ 15.5	$ 10.3	$ 12.5
Construction		$ 1.9	$ 2.0	$ 54.1
Subtotal Fusion Energy		$ 328.6	$ 368.4	$ 366.0
Less General Reduction for Use of Prior Year Balances		- 6.4	- 2.1	-
Total Fusion Energy		$ 322.2	$ 366.3	$ 366.0

Appendix II-D
Energy Supply R&D
Biological and Environmental Research
Budget Authority ($ in millions)

	FY 1994	FY 1995	FY 1996 Request
Operating Expenses			
Analytical Technology	$ 9.2	$ 8.7	$ 8.9
Health Effects	37.0	36.9	33.1
General Life Sciences	97.8	108.9	113.6
Medical Applications	49.9	48.1	38.9
Environmental Research	42.4	44.4	50.1
Carbon Dioxide Research	83.5	86.9	88.4
Program Direction	6.9	7.5	7.6
Subtotal	$ 326.7	$ 341.4	$ 340.6
Capital Equipment	$ 21.0	$ 24.5	$ 24.0
Construction	47.5	70.7	67.1
Subtotal BER	$ 395.2	$ 436.6	$ 431.7
Less General Reduction for Use of Prior Year Balances	- 6.9	- 5.4	-
Total Biological and Environmental Research	$ 388.3	$ 431.2	$ 431.7

Appendix II-E
Energy Supply R&D
Multiprogram Energy Laboratories - Facilities Support
Budget Authority ($ in million)

Operating Expenses	FY 1994	FY 1995	FY 1996 Request
General Purpose Facilities			
Operating Expenses	$ 0.7	$ 0.6	$ 0.6
Capital Equipment	5.8	5.8	5.8
Construction	26.4	21.8	21.2
Subtotal	$ 32.9	$ 28.2	$ 27.6
Environment, Safety and Health			
Operating Expenses	0.6	6.0	8.2
Capital Equipment	0.5	0.5	0.5
Construction	5.6	7.8	14.2
Subtotal	$ 6.7	$ 14.3	$ 22.9
Inactive and Surplus Facilities			
Operating Expenses	0.5	0.5	0.5
Subtotal	$ 0.5	$ 0.5	$ 0.5
Subtotal MEL-FS	$ 40.1	$ 43.0	$ 51.0
Less General Reduction of Prior Year Balances	- 0.8	- 1.4	-
Total Multiprogram Energy Laboratories - Facilities Support	$ 39.3	$ 41.6	$ 51.0

Appendix F
General Science and Research
High Energy Physics
Budget Authority ($ in millions)

	FY 1994	FY 1995	FY 1996 Request
Operating Expenses			
Physics Research	$ 144.7	$ 139.3	$ 147.2
Facility Operations	262.5	276.6	280.2
High Energy Technology	56.6	58.2	67.4
Subtotal	$ 463.8	$ 474.7	$ 494.8
Capital Equipment	$ 60.1	$ 57.7	$ 63.2
Construction	$ 86.3	$ 109.7	$ 127.6
Total High Energy Physics	$ 610.2	$ 642.1	$ 685.6

Appendix II-G
General Science and Research
Nuclear Physics
Budget Authority ($ in millions)

	FY 1994	FY 1995	FY 1996 Request
Operating Expenses			
Medium Energy Nuclear Physics	$ 108.3	$ 125.0	$ 103.9
Heavy Ion Nuclear Physics	64.8	61.2	66.8
Low Energy Nuclear Physics	23.5	24.6	27.1
Nuclear Theory	14.7	14.6	15.5
Subtotal	$ 211.3	$ 225.4	$ 213.3
Capital Equipment	$ 32.0	$ 28.0	$ 28.0
Construction	$ 102.0	$ 78.1	$ 79.8
Total Nuclear Physics	$ 345.3	$ 331.5	$ 321.1

Appendix II-H
General Science and Research
Superconducting Super Collider (SSC)
Budget Authority
($ in millions)

	FY 1994	FY 1995	FY 1996 Request
Operating Expenses			
Research and Development	$ 0.0	$ 0.0	$ 0.0
Program Direction	12.4	0.0	0.0
Subtotal	$ 12.4	$ 0.0	$ 0.0
SSC Termination	627.6	0.0	0.0
Capital Equipment	$ 0.0	$ 0.0	$ 0.0
Construction (90-R-106)	$ 0.0	$ 0.0	$ 0.0
Total Superconducting Super Collider	$ 640.0	$ 0.0	$ 0.0

Mr. MYERS. Well, thank you, Dr. Krebs. I see you have the background here, some good supporters here. Dr. Decker, for years we have had to talk about that quark up there, what it was going to do for the average family, and you haven't helped us a whole lot this morning. I am glad you found it. My wife has invented lots of things, but there is no use for them. I wonder if we found something here?

Okay, neutrons, we know something about it or I don't, but you folks do. We just trust that you do know. Again, Dr. Trivelpiece and I have had a lot of discussions about that and how we can go back home and explain to the taxpayer that we spent billions of dollars finding something that they don't need. That is what kind of bothers me, always has, but I understand that basic research and applied research more importantly, and this is something that you say you like to show and tell. We always had Admiral Rickover here and he played show and tell with us all the time. We had long discussions with him. That is the way I think we learn anyway. I hope we come up with something.

GALVIN REPORT

The Galvin report, we had Bob Galvin here. He was, again, I don't quite want to say critical, but at least he questioned are we using the labs in a proper way. Are we giving them missions that we should be giving them? Are we overmanaging the labs, oversupervising? Should we make them more competitive? Should we corporatize? So there are a lot of things he brought up.

You read the report, of course. Could you just—first, did you have any role whatsoever in the Galvin report? Were you interviewed by any part of the Galvin team?

Dr. KREBS. I made several presentations to different subgroups of the Galvin panel, in full committee and in one of the subcommittees. So I was involved in making the case.

Mr. MYERS. Could you see your fingerprints on the report anyplace?

Dr. KREBS. Personally not, but I am certainly very pleased about the recognition that the report gave to the missions of the Department and the Laboratories, particularly in basic energy sciences or basic science, and fundamental science, and I think an acknowledgment of the energy and environmental missions.

Mr. MYERS. Was it a fair critique to say that the labs have been overmanaged or I don't say mismanaged, but oversupervised?

Dr. KREBS. I think they have been subject to a kind of detailed oversight that has raised costs and not improved performance in areas particularly associated with environment, health and safety, and the administrative side of things.

Mr. MYERS. Well, he was critical of us, too, the report, Congress. I don't think he accused us of micromanaging, but maybe we put too many conditions upon what they should be doing or not doing. We need the buyouts.

To corporatize, I am not sure even after questioning him that day exactly what he meant. I thought when you turned the labs over and had the university run some of the labs, you have private companies managing or directing some of the labs. I thought that was somewhat of a corporatizing. I am still not at all sure what he had in mind.

Do you have any suggestions of what he had in mind here, and would that be the right direction for this country to go?

Dr. Krebs. Well, I have several reactions. One, I don't think it would necessarily be good for the laboratories to completely separate them from the Department of Energy. I do believe that the Department created these problems, with some assistance and encouragement from the Hill. But I also think that we together can find a way to change that, and I do believe we can change it faster than trying to figure out what an alternative framework might be. In fact, the Secretary has testified, I think is testifying right now, about our determination and the particular actions that we expect to take within the next few months to reduce the number of audits and oversight visits, to change our approach to laboratory procurement, which we think will save money and reduce—and produce time savings, and there are a number of other activities that we have committed to doing.

I think another thing that we will put in place, I think it is going to be in place, I can't remember exactly, in the next month or so, something called the laboratory operating board where we, not just me as the person who is responsible for the energy research laboratories and making energy research investments, but also the other assistant secretaries will sit at the same table, will have outside experts' participation to reflect on whether or not what we are proposing is the right thing. I think these are the sorts of things we can do within the Department that will work faster to change the burdens that we placed on the labs.

Mr. Myers. Kind of like a passing thought there he did mention in his report, as you recall, that the British have corporatized or privatized, that they do—are you familiar with what the British have done with their labs?

Dr. Krebs. I know that they have done it. In detail I can't speak to it. I can probably get you some material about it. I know that for at least one of the laboratories that they have privatized, Harwell, has some serious problems. There has been some press coverage about some serious concerns about whether or not they are maintaining their scientific base. They have been able to sell their technology, but not necessarily maintain their scientific base, and, of course, that is what is really special about these institutions.

[The information follows:]

British Research Laboratories

Laboratories of the United Kingdom Atomic Energy Authority (UKAEA) are now government owned. There is currently a bill in Parliament to sell off the commercial activities of the UKAEA to private enterprise (called "privatization"). This includes all the work that is judged to have a viable commercial future, such as work of the National Environmental Technology Centre and work at several laboratories such as Harwell. It is expected that this bill will pass.

The Government will retain UKAEA responsibility for decommissioning of nuclear facilities that are no longer used, the operation of the remaining nuclear facilities, the disposal of radioactive waste, and other functions that are more appropriate to government, such as the UK's input into fusion research.

While full privatization is only now being proposed, many of the science and technology activities at UKAEA laboratories, such as Harwell, have been required for many years to secure 50% or so of their funding from government and private sources outside of the UKAEA. This has led to growing concern among scientists about eroding of the science base. Many knowledgeable officials say that the structure at Harwell is no longer that of a cohesive laboratory with staff working together on important national problems. Rather, it has become a job shop and is fragmented into small competing groups of scientists and technologists pursuing individual near-term applications that can attract funding from outside groups. There is concern, therefore, among UKAEA senior officials and scientists and engineers that privatization will lead to insufficient funding to maintain the science and technology base.

Mr. MYERS. He mentioned that he thought there ought to be competition, possibly the three weapons labs. He described a different mission for them. The thing he kept saying was the Department of Energy should be a customer of the labs. I don't quite understand.

Can you explain what he means by that? He didn't quite make it clear when he was here what he meant by DOE being a customer of the labs.

Dr. KREBS. Well, I think the Department of Energy is responsible for establishing and identifying with you, with others the energy and environmental and national security needs of the country. Obviously, on the national security side they talk to DOD, and then we look for the best places and people to carry them out.

We have used the laboratories over a long period of time. In a sense, the laboratories are our suppliers of science and technical innovation, and I think that is why he views us as the customer. We identify the needs, we do work with our suppliers. I think I tried to indicate that in my testimony, to figure out how do we solve these problems, but then basically they are on the mark for helping us, you know, for delivering solutions to those problems, and they have done a wonderful job, particularly if we think about it in terms of the national security program or fusion or some of these other areas, quarks. They have delivered.

Mr. MYERS. Would we know a quark if we saw one going home tonight?

Dr. KREBS. You wouldn't. I wouldn't.

Mr. MYERS. I don't drink that much anymore, but—we have some other questions.

Mr. Bevill.

ELIMINATION OF DOE

Mr. BEVILL. Thank you, Mr. Chairman.

Dr. Krebs, we are pleased to have you with us again. I am sure that you have heard some of the recent rumblings about deactivating or abolishing several departments of our government, including the U.S. Department of Energy, and that is important work that really ought to be divvied up and given to other Federal departments or agencies. So I would just like to get your opinion based on your experience and knowledge, what would be the implications of such an idea on the Office of Energy Research and the crucial scientific work that you and your department do?

Dr. KREBS. Well, within the Office of Energy Research, we basically do high energy and nuclear physics and we do basic research in energy and environmental issues, and we carry out the development of both basic applied technology research for fusion.

Clearly, the Department of Energy has had a major role in high energy and nuclear physics. Splitting those programs out may be more conceivable, but then I think you wouldn't get something like this because we have very smart people working on fundamental research concepts that have paid off for the energy missions.

Within the basic energy and environmental sciences and fusion, they are part of the general energy mission of the department, and I don't believe that you have the same motivation for this work, if you take them and split them off someplace else. I do believe that the energy and environmental missions and the national security missions of the Department will persist. We are going to have to clean up these sites. I am not at all persuaded that dismantling the Department saves money, anymore money than we are predicting that we can save.

Mr. BEVILL. Could these successes be duplicated profitably by the private sector?

Dr. KREBS. No. Every indication from the private sector is that they are pulling out of basic research and they are telling us that the Federal Government should maintain its investment, and that this is something that is unique by comparison to other developed countries as well as developing countries. This is a part of the U.S. Federal investment that people want to emulate around the world.

Mr. BEVILL. All right. I have several other questions, Mr. Chairman. I will submit them.

Mr. MYERS. Thank you, Tom.

Mr. Fazio.

SUPPORT FOR BASIC RESEARCH

Mr. FAZIO. Thank you, Mr. Chairman.

Martha, good to see you. I don't see you often enough. We have to have a hearing. I wanted to follow up on some of Mr. Bevill's questions. You indicate that you think the private sector is pulling back from basic research and asking government to do what has traditionally been its job, but I don't see any evidence that we are being asked by the private sector to emphasize it.

In fact, in the face of these calls for the elimination of the Department, the dismantlement of the Department, I hear no one speaking up and saying this is not a good idea either from the standpoint of, you know, saving money or improving performance.

I mean, I think that there is obviously opposition out there, but I am wondering where it is in the sense that people in the private sector may have more influence at this point in time not only in the country, but certainly in this Congress. What evidence do you see? Where are you hearing this cry for more basic government research from? Because I would love to hear it.

Dr. KREBS. First of all, I would not say I am necessarily hearing for more from the private sector. I think what they are saying is sustain and maintain the capability that we have invested in.

Mr. FAZIO. Stay the course?

Dr. KREBS. Yes. And I also think that at least within the context of energy and to the extent that you talk with people from the energy producing or utilizing part of the world, there is a lot of misunderstanding about the character and the quality of the basic research effort within the Department, and for those who are aware, I think it is very clear that the DOE effort within the Office of Energy Research is on a par with, at least certainly in size of investment, with the National Science Foundation. When you look at the investments we make in the large user facilities, we support 15,000 people, mostly academics, which are utilized by the private sector in pursuing state-of-the-art research, and it is a fact, and I think it is one of my challenges to make people aware that when you think about preserving the basic research capability in this country that you don't just do it by supporting the National Institutes of Health and the National Science Foundation. There are other agencies in government which make a tremendous contribution, and the Department of Energy and the Office of Energy Research are one.

SHARE OF BASIC RESEARCH

Mr. FAZIO. What share of the total basic R&D budget do you have, maybe 20 percent?

Dr. KREBS. Oh, I would have to add it up.

Mr. FAZIO. I have seen a view graph somewhere.

Dr. KREBS. NIH is about half just by itself, and we are probably 15 to 20 percent.

Mr. FAZIO. Has that been fairly stable for a decade or so or is there some fluctuation? Are you going up or down proportionately to the others who may have different subcommittees who fund them, who may have other authorizing committees who nourish them, you know? Are we doing this rationally or is this just the vagaries of the budget process? That is the second question.

Dr. KREBS. My sense, and I would have to actually provide you with data for the record because I don't have it in my head, but my sense is over the last 10 years or so the scientific community has been the beneficiary across the board of good support from the Congress.

I think as we look forward to the next few years, the concerns we have, and the message that the American people are giving to the Congress, and of what might happen to DOE, people just aren't aware enough of these programs. That is the concern.

[The information follows:]

BASIC RESEARCH

The majority of the Department's basic research is conducted by the Office of Energy Research in the High Energy Physics, Nuclear Physics, Basic Energy Sciences, and Biological and Environmental Research programs. Other Department of Energy programs which perform small amounts of basic research include, Defense Programs, Energy Efficiency and Renewable Energy, and Fossil Energy.

The following table details basic research by government agencies.

Basic Research Funding
(in Millions of Dollars)

Department/Agency	FY 1994 BA Actual	FY 1995 BA Estimate	FY 1996 BA Estimate
Health and Human Services	6,024.0	6,226.1	6,454.8
National Science Foundation	1,870.7	1,960.4	2,107.6
National Aeronautical and Space Administration	2,014.4	1,850.2	1,841.3
Department of Energy	1,619.5	1,685.0	1,784.6
Department of Defense	1,167.2	1,227.0	1,213.9
Department of Agriculture	609.6	603.6	614.8
Smithsonian	131.2	132.2	136.2
Environmental Protection Agency	101.4	102.2	119.7
All Others	178.6	188.0	194.5
TOTAL	13,716.6	13,974.7	14,467.3

HUMAN GENOME

Mr. FAZIO. Well, I think there needs to be more organized support from the influential private sector which in many cases is profiting today because of basic research done 20, 30, 40 years ago, maybe in some cases even more recent. But I don't think we have that entity, but I would be very interested in, for the record, receiving some sort of a picture of the evolving share of basic research that is being done at DOE vis-a-vis the other agencies that you mentioned and some you haven't.

Let's talk about human genome. It was touched on earlier. I think it is one of the more impressive things that government has done in recent years. If you could, I would ask you once again to talk in layman's terms about what we benefit from in this regard, and if you could, Mr. Myers and I both suffer. We have good eyesight, but we don't always understand.

Mr. MYERS. It is what is behind that we worry about.

Mr. FAZIO. We do need, I think, to be able to put a human face on the genome project, and that is one of the problems we have in government period here, we talk too often in programmatic terms and we don't relate it to people we know and love. So if you could try to do that, but also, and I am just going to let you talk for a while, indicate where we have played a role vis-a-vis NIH, because I think to some degree NIH gets far more exposure.

After all, it is thought of in health terms, and so their role tends to get greater public exposure, and I don't think people appreciate what DOE's role in the evolution of this very rapidly changing picture comes from.

Dr. KREBS. I am happy to have the opportunity. You know, from the very beginning of the Atomic Energy Commission and then ERDA and the Department of Energy, these agencies have had the responsibility. They recognized the need to understand the health and environmental impacts, effects of energy production and use. I have said it several times now.

Of course in the beginning it was radiation, We needed to understand the impacts of radiation because we were building bombs and we were exploring the use of nuclear energy, and then as the energy mission got broadened, we began to also try to understand the impacts of the various kinds of chemical effluents that arose from using fossil energy or using the other things that were involved in energy use, and we originally began by studying large animals.

In some cases, of course, we also studied humans, and that has been a big debate over the last year. But from the scientific point of view, we studied large animals. We studied them and then we got better at it and we studied cells, and now we are even better at it. When we started in 1946, we didn't know about DNA, and now we do. And so the fundamental question is how does radiation, how do chemical contaminants affect—how do they damage cells, how do the cells repair themselves, and now we are studying at a molecular level because we need to understand the health and environmental effects of energy.

What we also did, of course, in this period was we built this tremendous capability at the national laboratories, not only in life sciences, but also in computer science and in instrumentation, robotics, automation, and it is this capability that was not supported by the NIH, was not conceived of in their approach to health science that we bring to the table. In fact, you have got three billion base pairs in every cell, and in order to actually sequence them you have got to be able to handle a lot of data. You have got to be able to do it without mistakes and people generally. Most biology is hand work, and it is this capability for automation and computer science that is the special contribution, and it is that capability which made the difference in being able to locate the breast cancer gene and to locate the colon cancer gene, and will make it possible for us to identify some of the four to five thousand disease genes that we know about.

It enables us to work with and is making a huge difference in the biotechnology industry. In terms of faces, I mean, to me, of course, I remember the people at the labs who are engaged in this or the people up at the Massachusetts Institute of Technology who are engaged in human genome research for us and also in different ways for the National Institutes of Health. These people are asking different kinds of questions that they couldn't have asked without the work, the technology that has been involved in the Human Genome Program.

Mr. FAZIO. How do we integrate our program with NIH's? Is there some governing entity that kind of keeps us moving closely together? Do we respond to each other? I mean, how does this work?

Dr. KREBS. There is a coordinating committee that intimately decides what the investments and what the program characteristics will be. Last year, there was a joint publication in Science Magazine by the Director from NIH and the Director from DOE as to what the changes in the programs were, what the accomplishments of the programs were, and how they were going to change those goals as a result. We make investments in certain areas, NIH makes investments in others.

Mr. FAZIO. We are not in a position of holding one another back? Have we been pretty fulsome in our support for both of these programs?

Dr. KREBS. I think it is one program as far as the program managers are concerned.

SCIENCE FACILITIES INITIATIVE

Mr. FAZIO. Let me go on and ask some questions about the facilities initiative. Operating time seems to be one of the things you hear a good deal about as scientists talk about the need to have available to them the kinds of facilities that allow them to do the sort of breakthrough research that we still do, but the price tag is increasingly difficult to sustain as we take a look at funding the Department's budget.

I wonder if you, given your management at the research end of DOE would speak to this question of what we need to be investing in in order to get the greatest return on our investment. I know there are times when we would want to do it all, and we have a wish list that is unending. On the other hand, we don't want to be accused, rightly of being penny wise and pound foolish when it comes to investing in facilities.

Dr. KREBS. I have some more pictures, just one. It is actually a map of the user facilities, the DOE user facilities in the United States that are included in this user facility initiative. The yellow stars are essentially the user facilities. The black dots are the institutions, not the users, but the institutions that use these facilities.

About half of them are industry and about half of them are universities. The universities, if you go in and you look at how many users at each institution, you are going to see many more users per university than you do per industry.

Mr. MYERS. You have got to be careful. You are going to sink California and the East Coast. It is going to happen.

Mr. FAZIO. If it weren't for Oak Ridge and Illinois, we would be in trouble, wouldn't we?

Dr. KREBS. But, of course, this is part of the historical investment at the national laboratories, that they exist within the complex.

Mr. MYERS. That is what peer review does for you, too, I think.

Mr. FAZIO. Still fighting that battle.

Dr. KREBS. Anyway, what we have accumulated over the years through the initiative and innovation of the scientific community and the insight of the Congress in supporting these facilities——

Mr. FAZIO. There you go again, talking about our sight.

Dr. KREBS. Mine is getting worse, too—is that we have capabilities, and actually at your table there is the detailed list of the facilities that are beneficiaries of the initiative that is in the 1996 budget. We have a capability that is oversubscribed.

We have two to three times the number of high quality proposals at these facilities than can be supported, and over the last few years the operating time of those facilities has declined in some respects because of a focus on some other kinds of managerial issues, but also because of the general pressures on the DOE budget, and what we are asking for in this budget is for a 10 percent increase in the budgets of these facilities to obtain an increase in the number of users from about 15,000 to maybe 18,000 or 19,000 throughout the country, to increase the amount of operating time, particularly in the high energy and nuclear physics area, but also in some cases, for example, the Stanford Synchrotron Radiation Laboratory will double its operation.

The High Flux Isotope Reactor at Oak Ridge and the High Flux Beam Reactor at Brookhaven will increase their operations by something on the order of a third, I think. The details are available. We are also going to improve the capability of the beam alliance of these facilities so that we can do new kinds of science, not just serve more users, and so I think you get a lot of leverage for a 10 percent increase.

Mr. FAZIO. A 10 percent increase?

Dr. KREBS. In the budgets of these facilities.

Mr. FAZIO. What are the major components of these additional costs? Is it power costs? I am tempted to ask you how you feel about selling power marketing administrations, given the fact that those on the West Coast certainly benefited greatly from that cheaper Federal power. Go ahead, say whatever you want.

Dr. KREBS. I can't say anything about that. I really don't know.

Mr. FAZIO. I hope you did in the past.

Dr. KREBS. I don't know anything about it really. Some of it has to do with not so much increased power costs, but simply paying for the power that you need to operate. In some cases with respect to, for example, the reactors, we have jimmied up the expectations for operating research reactors to the level of treating them like utility reactors. We are not convinced that that is the proper standard. I think it increased the costs.

As a consequence in the past we looked at those and said we need to maintain the environment, health and safety standards rather than providing operating time, and we are trying to correct that through this initiative.

[The information follows:]

IMPACT OF SCIENCE FACILITY INITIATIVE ON FACILITY OPERATIONS

The special situation with regard to leverage for the user facilities arises because there are relatively high costs for maintaining the laboratory in a ready to run condition and to provide the staff needed to operate the facility. Once this "ready to run" condition is achieved the incremental costs to operate (primarily electric power and some extra staff) are by comparison, quite modest. An example is the Alternating Gradient Synchrotron (AGS) at Brookhaven National Laboratory which, in the FY 1996 request, is expected to run for about 21 weeks on an operations budget of about $45 million. For the AGS in this situation, we estimate that additional running would cost only about $250 thousand per week. Similar leverage situations exist at both Fermilab and Stanford Linear Accelerator Center.

Mr. FAZIO. Mr. Chairman, I have a number of questions. Do you want to ask some more?

Mr. MYERS. Go ahead.

Mr. FAZIO. Is it okay if I just keep going?

Mr. MYERS. Yes.

HIGH ENERGY PHYSICS

Mr. FAZIO. I would like to go on and talk a bit about high energy physics, if I could. I appreciate this effort. We will need to struggle with it given our budget problems this year, but to the degree to which you can quantify the additional leverage for rather modest investment would be helpful, I think.

We want to get the greatest utilization out of what we have already invested in. But let's talk about high energy physics. Obviously, with the demise of the Supercollider there was a disarray in the high energy physics community, and I understand Sidney Drell was assigned the task of trying to piece together a future should there be one, and we all assume there will be some time.

I don't think anybody on this committee ever gave up pushing for it. We certainly saw the problem not as a scientific problem, but more a budgetary crunch with cost overruns and things that made the political heavy lifting too much for successive congresses to bear. But if you could, in the wake of that termination, give us an update as to where the Drell report, at least and maybe other perspectives you are aware of would suggest where we go if we are going to continue to make the kind of progress that historically this country has led in.

Dr. KREBS. Well, another major element of the budget request is in high energy physics, and essentially I have to acknowledge that last year I think the Congress and this committee in particular took up the responsibility for enabling that community to operate at a little more effective level. In this budget in 1996, we——

Mr. FAZIO. I think it was guilt money.

Dr. KREBS. I am sure they are happy however they got it.

Mr. FAZIO. Yes, I know.

Dr. KREBS. Within our budget, however, we have acknowledged the recommendations of the Drell panel and essentially I see what the increase for high energy physics gets you is more operating time at the existing facilities, Fermilab, Stanford, and the Alternating Gradient Synchrotron at Brookhaven.

For me, what that means is that the young people both at the level of graduate students, post docs and the young faculty will have a chance to do the science that will essentially make their reputations and enable them to do the new science at the end of the century and the beginning of the century wherever that may be.

We are also building a capability by doing the upgrades on the Fermilab Main Injector and providing a capability at the B–Factory to do new science, science that is not accessible with the current capability at these facilities, and so that keeps us at the edge. Then there is a small amount of money, at least starting within the 1996 budget—It could grow depending on the outcome of negotiations and discussions with CERN—to initiate some participation in the development of the Large Hadron Collider at CERN. Of course, a lot of that depends on what the future budgets of this field look like.

ALTERNATIVE HEP APPROACHES

Mr. FAZIO. If you could, try to encapsulate for me the various alternative approaches we are going to try to take to get further in the field. I mean, what are we going to be putting our bucks in? You mentioned some of them, but if we are not going to have a Superconducting Super Collider and yet we still have some goals out there, we found obviously a top quark, but we obviously have future goals, and what is our fall back and fight position?

Dr. KREBS. Well, you know, obviously the community, and I support it, would like to find a way to participate in the Large Hadron Collider. I think that probably from 2005 or so, which is when they say that LHC will be available, for at least the next 10 years, that is going to be the absolute frontier.

They are on the record for saying they want, over a period of 10 years, 40 to 50 million dollars a year for us to participate. By comparison to the SSC, that is pretty inexpensive. Now, we may have different ideas about how we make that investment than they would like us to make it, but nonetheless we are working with the community to identify those, and so I think, from basically 2005 to 2015, where CERN is where the frontier will be. In the meantime, of course, we are trying to develop something that might be the next generation facility.

Mr. FAZIO. We are going to generation skip, are we, something they do over at the Ways and Means Committee all the time, but we are doing it here in high energy physics.

Dr. KREBS. That is an issue of investing in technology and in new technology. We are doing that, too, because in the 1996 budget part of the increase, part of what we have done in response to the Drell panel is to increase the investment in high energy physics technology in both what is probably stretch technology or what we already have a concept about and then some radically new concepts that may pay off with the more cost-effective accelerators.

Mr. FAZIO. So there is a germ of an idea for the next generation after CERN that is already being kind of conceptualized? Cost beneficial, I heard you say, too.

Dr. KREBS. Could be. I don't want to promise that.

Mr. FAZIO. Well, I think it would be impossible, so you shouldn't.

Dr. KREBS. On the other hand, if you try to generate, and I don't have it in my head, dollars per GEV, the cost of accelerators on a basic unit per energy has gone down over the lifetime of the field.

Mr. FAZIO. Do you think we have lost our advantage permanently in the demise of the SSC? What do you see? Be a nationalist for a minute. Is it over for the United States high energy physics community? Are we in a new era where we are going to be more international anyway? We always wanted them to come to us anyway.

How would you, in retrospect, view the impact it has had on our scientific community? You mentioned the younger folks whose careers were truncated by an act of Congress, but how would you evaluate what happened to this country in its traditional role in this field as a result of the decision to stop further funding?

Dr. KREBS. I don't think it is the end of the field. I don't think it is the end in the U.S. When I have had conversations with the Director of CERN, and I have had conversations with people in the European Community, the U.S. is still at the forefront. I mean, the quark couldn't be discovered any other place but in the U.S. We have people in accelerator science and in high energy physics who are necessary, I believe, to really carry out the scientific program at CERN, and they acknowledge that they want us in the game. So I think that if we have the opportunity to participate in CERN, which I believe we ought to do, I urge you to support us as we move forward in this effort. Then we are still going to be at the forefront, and we still will be able to participate in the next—if not drive the concept for the next—accelerator.

I do also believe that high energy physics, like a lot of the science, has been international and it is going to be more international.

B–FACTORY

Mr. FAZIO. Let me go on to the B–Factory because if we are into cutting out live science projects as a way of striking a blow for the taxpayer, there are probably other Members looking right now for the next hot button item they can take to the Floor to prove their mettle. I am wondering if you would comment a bit on the B–Factory because to some degree, you know, people could consider this one still within reach in the sense of a budget cut.

Would you speak to the issue of the B–Factory, the progress we have made to date on it, perhaps once again for laymen, talk to the extent you can about the scientific merit, and the benefits to the Department and to the scientific community in general?

Dr. KREBS. Well, at this point we are about 30 percent complete, as I understand it, and the procurements are out. The details of where we would be by the end of the year, I would have to get you for the record, the end of the fiscal year. Clearly, I am always challenged. The B–Factory perhaps even more than the top quark is dealing with some real subtleties in how we conceive of the interaction between quarks.

[The information follows:]

DETAILS OF THE B–FACTORY CONSTRUCTION STATUS

The B–Factory is about 30% complete at this time, is on schedule, and is proceeding very well. By the end of FY 1995, it will be about 40% complete. The existing PEP tunnel has been cleared and refurbished. The original PEP magnets which will be reused in part in both the high energy and low energy ring have all been refurbished. Magnet procurement for the low energy ring is beginning. The klystron development necessary for the RF system is proceeding very well. The most recent prototype klystron is being tested and is likely to prove fully satisfactory for utilization in the B–Factory.

Appropriations for this project were made in FY 1994 and FY 1995; with the FY 1996 request appropriations would be 75% complete. The final year of appropriations is scheduled to be FY 1997.

Mr. MYERS. Music to his ears.

Mr. FAZIO. Subtlety isn't my strength, I want you to know, nor is it my colleagues', so help us, please.

Dr. KREBS. On the other hand, it is a kind of science, and we will be pushing a frontier of understanding: It is the charge parity, CP violation, which doesn't tell you anything, but what scientists look for and what we utilize in making applications in the real world are certain kind of symmetries.

Part of how we use different kinds of materials depends upon their having an orderly structure, and trying to understand the ordered structure of crystals enables us to make things like the semiconductor devices. It is what is behind utilization of certain kinds of photovoltaic materials, and so there is order.

Basically, what we are looking for is to understand the order or the ways that order breaks in very fundamental particles and the interactions between them, and when we understand those things, we may be able to do something more. I mean, again, I go back to it. We didn't know what protons were and now we treat disease. It is very hard to predict.

Mr. FAZIO. Well, I predict we are going to have more opportunity to interact over the next couple of months and maybe we could work on this a little bit.

Dr. KREBS. I look forward to it.

GALVIN REPORT

Mr. FAZIO. I don't look forward to working on what I know we will be working on. I look forward to seeing you. I know we will be coming under assault and we need to do our best to make our case. The Chairman mentioned the Galvin report and indicated that he had been critical of us. I think micromanaging was one of the things he accused us of. He advocates corporatization of the labs. It is not so much a privatization as a different management structure which I think would put in place in each laboratory setting a group of, I am sure, learned individuals who would make judgments about the management and the direction of these labs.

Obviously, there is a lot of soul searching going on in every area of the department as well as Congress about their future. I would be interested, since you have such a background in lab management and participation, you know more than many about, some of them in great detail, not just all of them in general. I wonder what you think of that management structure that the Galvin report cited as perhaps the way of the future.

Dr. KREBS. Well, I think in the private sector you would be hard put to find a company that just does research. There are obviously some contract research organizations, but they tend to generally focus pretty much on the short-term research, and they treat their customers in a way that basically and foreshortens their horizon.

What has been crucial about the DOE laboratories has been the fact that the Department makes an investment from the very beginning, from the very basic research through applied. I would really worry if we were to separate it and to say that there was an independence, that the Department would not truly own these institutions and own their outcomes, you know.

I think you would see a lack of commitment, and for whatever the Galvin committee's observations of overmanagement or lack of commitment by the Department, which in another guise you know that I had my own criticisms, I do believe that we need to sustain the relationship and a sense of ownership from the Department for these laboratories.

More distance in the long run, in terms of making a connection between these laboratories and the missions of the Department, is not going to be helpful. As I said, I think the Department can make a change with the support of the Congress, can make a change in how it overmanaged the laboratories in the past.

Mr. FAZIO. So your criticism of the overmanagement would not lead you to almost a divestment because you feel that since there isn't a product per se, there isn't an independent source of funding, there isn't a constituency really for basic research that is out there, the Department still has to play this integral role of—what is the Department's role?

Dr. KREBS. It is a customer and a partner in identifying the mission, what the mission requirements are. I think—I guess my basic feeling is the Department and its predecessor agencies knew how to work with the laboratories in the past. I think we still know how to do it, and I think that the laboratories and the Department will be better if we are urged and encouraged and in some cases forced to do it right.

I think we will be better for sort of recovering and doing our job, not perhaps exactly the way we used to because the world has changed, but certainly, you know, learning from the new principles of the world. I also think we could do it faster. I think it does take time to enact legislation, even though you are obviously moving very fast here right now. I think to act wisely in legislation takes time.

LABORATORY OVERSIGHT

Mr. FAZIO. What are you and the Department doing, this is my last question, to deal with the problems you identified before you were where you are and try to free up some of the bureaucratic oversight and to give more latitude, freedom, management, responsibility to the labs? Are we acting to do what is needed to make these kinds of adjustments now? We are not waiting for anybody to tell us?

Dr. KREBS. I believe so. I believe so. I mean, we have made commitments and we are beginning to reduce the number of audits and oversight visits that are scheduled for both administrative and management reviews and environment health and safety. We are looking at changing the procurement requirements that are placed upon the national laboratories. We believe we will have an order out, not an order, but a notice of proposed regulation change, that I believe is being reviewed by OMB, that notice should be out within a month, six weeks.

I think these will make a big difference in how the labs manage themselves, interact. There is the realignment activity, which I think is going to look hard at the field structure.

Mr. FAZIO. Your field structure, the Department's?

Dr. KREBS. Yes, the field structure within the Department, and it is our hope and expectation that that will have an impact.

Mr. FAZIO. The impression I get is that this problem is much more a problem with the field staff and the labs than it is from the Department in Washington. Maybe I am wrong. Correct me if I am.

Dr. KREBS. I think that is not always so fair.

Mr. FAZIO. It is pretty much conventional wisdom.

Dr. KREBS. Well, it is a mix. It is a mix. There is a lot of disconnects sometimes, lack of communication between headquarters and the field, but sometimes having been at the lab I know that the field offices feel as much done to as doing, just as much done to as the labs feel done to, and so I think it is a little more complicated. We need to work that out.

Mr. FAZIO. Okay. Thank you, Mr. Chairman, for giving me so much latitude myself here. Thank you.

Mr. MYERS. Well, thank you. It is just you and me.

Mr. FAZIO. That is regrettable. You know, I was hoping that——

Mr. MYERS. Well, it is the best we have.

Mr. FAZIO. Well, obviously I agree with you there.

Mr. MYERS. At this time anyway, that is for sure.

Dr. KREBS. I think I better be careful.

Mr. MYERS. That wasn't a question.

Dr. KREBS. I know.

DEPARTMENT DUPLICATION

Mr. MYERS. Thank goodness. Some of the discussion going on here, it has always concerned me about the duplication. We have talked about that many times in the past, there is nothing new, I guess. I will hammer away. But as I have seen the Department of Energy growing out of the old Atomic Energy Commission, when I first got here the Atomic Energy Commission became ERDA, then went into DOE and DOE now keeps creating new programs.

Some agencies, if they call it that, such as some of the things you are talking about here, we heard a couple days ago when we had the office of environment, safety and health. Do you ever talk to each other? Does she work for you or do you work for her?

Dr. KREBS. We work together, and we talk.

Mr. MYERS. There is a lot of duplication here. It is difficult for us to see here and you show us, but then we wonder are we paying for duplication. Is that department or agency really required? Aren't you doing that, too? Couldn't that just be an office within your office? It just seems to me like there is a lot of duplication.

Dr. KREBS. Well, I don't believe that Dr. O'Toole's organization does research per se, although I know they are involved with—they have——

Mr. MYERS. She is asking for research money, as I recall. Go ahead.

Dr. KREBS. I am not familiar with that, I have to say.

Mr. MYERS. That is what worries me a little bit.

Dr. KREBS. What I know is that we are engaged in the basic research. She may indeed have some epidemiological studies that she wants to pursue. We don't do that. If she is interested in epidemiological studies, especially associated with radiation survivors and radiation workers, Energy Research does not do that kind of work.

But what I can assure you is that within the energy and environmental areas, and I have to say more strongly with the energy programs, fossil energy, nuclear energy, energy efficiency, we are working very closely with the program managers in those areas to identify opportunities for basic research.

We try to work with them so that we invest in areas that they can pick up. Places where this occurs wonderfully well are at places like the High Temperature Materials Laboratory at Oak Ridge, the Combustion Research Facility at Sandia in Livermore, and, you know, we make investments in basic science while the energy efficiency programs make investments in applied research areas. There are integrated collaborations between the National Lab folks, industry investigators and universities. So we work at it. We work at it.

GALVIN REPORT

Mr. MYERS. Well, another thing, going back into the Galvin report, I hate to beat it to death here, but the 10 labs that they looked at, I noticed the greatest breakthrough in years was the top quark up here. They didn't even look at, apparently didn't even go to Fermi to examine Fermi.

Dr. KREBS. I believe there was an interaction with some of the single purpose laboratories, and some of the members, of course, on the panel, one of them Henry Kendall did his research, I think, at SLAC and he got a Nobel Prize in high energy physics. So it is not as if the awareness and knowledge weren't present on that committee.

INDUSTRY/LABORATORIES/UNIVERSITIES INTERACTIONS

Mr. MYERS. Do we have a proper blend today with the private sector working with the labs, with the university community working with the labs?

Dr. KREBS. I am sure there is always room for improvement, but there is no question that there has been a strong emphasis on having stronger collaborations and when our program managers review activities at laboratories, we are looking for collaborations.

Certainly this focus on increasing utilization of facilities is important because one of the things you notice at a place like the National Synchrotron Light Source at Brookhaven, if I brought a picture of that you would have seen that this is sort of a maze of beam lines.

Mr. MYERS. Well, Fermi has the same thing.

Dr. KREBS. That is true. What is interesting to me about the Synchrotron Light Source is you have industry folks next to university folks next to laboratory folks. You have got biologists next to physicists, next to chemists, and just by having to live——

Mr. MYERS. How did the chemists get in there?

Dr. KREBS. Chemists are okay. I used to work for one. He was a great guy. Chemists use X-rays, too. But you get a lot of cross-fertilization, and one of the things about duplication, I need to tell you, is that no scientist, no really good scientist wants to duplicate somebody else's work. They want to do their own unique things. They want to take maybe somebody else's work a step further, but they don't want to copy somebody else, so there is an innate——

Mr. MYERS. How can they avoid it if the right hand doesn't know what the left hand is doing?

Dr. KREBS. Yes, but part of what they do is to keep up with each other. That is what goes on in the program management of these areas, is to make sure that we have got folks who are at the edge.

GALVIN REPORT

Mr. MYERS. Well, from a distance, I use my agricultural background here. No farmer ever plowed a field twice in the same year. It seems like we go back and replow these fields rather frequently here, the same area. I am using an analogy. We talk about a bale of hay, remember, I try to put it in simple language. I call it cow pasture language so I can understand.

Going back to the Galvin report, one of the suggestions they made was a savings up to 40 percent in administrative costs could be saved by elimination of unnecessary supervision and duplication, again layer upon layer of oversight. How much accuracy does that have?

Dr. KREBS. I think there can be significant savings. As I understand it, he said 20 to 50 percent. That is what he said. We do think that there are considerable savings that can be made in the administrative costs associated with the laboratories, probably, usually in their overhead, but also in the activity that we carry out in exercising oversight with respect to the laboratories.

Mr. MYERS. Where do we find that in your budget request?

Dr. KREBS. In my budget request?

Mr. MYERS. Pardon me for interrupting you. Here in Energy Supply, Research and Development Advisory and Oversight was $12 million and a half last year, now $9.8, but part of that was transferred over to the technology transfer, as I understand. I don't see any reduction in that this year because things were transferred. Maybe you want to provide it for the record.

Dr. KREBS. I am going to have to provide that.

[The information follows:]

Reduction in Oversight of the Laboratories

The Advisory and Oversight Program Direction budget provides the staff for a wide variety of programmatic and support activities in the Office of Energy Research. It does support a small staff to assist me in carrying out my statutory responsibilities regarding the DOE laboratories and to manage the Multiprogram Energy Laboratories-Facilities Support budget. The program also supports a centralized environment, safety and health (ES&H) staff as the most efficient means to provide the broad range of technical support required to ensure compliance with ES&H regulations in the operation of our research programs and our numerous large and complex scientific facilities. Other activities supported by Advisory and Oversight include ER's strategic and long-range planning, and management of the Energy Research Analyses and ER Laboratory Technology Transfer programs. In addition to the funding for the 19 FTEs transferred to the Technology Partnerships program, the Advisory and Oversight base funding level was also reduced by $500,000 due to the FY 1995 general reduction in Energy Supply R&D. The ER staff funded by this program has been reduced by 3 FTEs in FY 1996; and the savings from these FTEs will be used to offset the normal salary and benefits increases of the remaining staff. Any further reductions in the Advisory and Oversight program and staff would be very difficult to absorb without corresponding reductions in the associated program activities.

My earlier comments concerning possible reductions in administrative costs associated with the laboratories apply on a broader scale across DOE programs. It will depend on how Headquarters program offices and DOE field offices deal with the laboratories after the Galvin Task Force recommendations are analyzed and any resultant process changes are put in place. The real impact of any such changes wouldn't be felt until FY 1997.

ADVANCED NEUTRON SOURCE

Mr. MYERS. It would help us, tell us how much more we can cut this year, I guess. You said you wanted help. We are here to help you.

Well, the Advanced Neutron Source has been mentioned this morning as being terminated. If we should find the money someplace, and as I understand the primary reason it was being terminated is the tremendous costs, pretty much the same reasons why this SSC was terminated.

This committee has been burned many, many times through the years that Mr. Bevill and I have been on the committee. If we would continue, what would we get from the ANS?

Dr. KREBS. Well, neutrons are a tremendously powerful tool to understand the structure of materials. Last year I brought up, you may remember, the first gear of the Saturn transmission that had been characterized by the High Flux Isotope Reactor at Oak Ridge, and it was a collaboration with GM and the Oak Ridge scientists, and at that time I said that if we had the Advanced Neutron Source we could, because of its higher intensity, get more neutrons. You get them faster, you can do bigger things, bigger pieces, bigger gears in a shorter amount of time and you could characterize the whole power train and improve the way we manufacture it and do the quality control in the production processes, and that was an example of the kinds of things in a practical way that the Advanced Neutron Source would allow us to pursue.

One of the things that neutrons let you do, and if you have more neutrons, it just takes less time and you can serve more users, is study the kinds of materials because neutrons have what are called spin. You can study magnetic materials in a way that, for example, you can't at the X-ray sources, so it has a complementary kind of capability, and magnetic material——

Mr. MYERS. That was my next question. You got into it. Go ahead.

Dr. KREBS. Magnetic materials, you know in a car, you have got lots of little motors and lots of magnets controlling lots of different things in cars and in other kinds of processes and devices that we use in everyday life. If we could understand better how magnets work, how we can make them, especially permanent magnets, then we might reduce the energy use in some of these things we use every day, whether it is radios or cars or whatever, and the Advanced Neutron Source would help us do that more and better.

Mr. MYERS. You mentioned, I think, GeV a while ago, that is the X-ray, I guess; is that right? This would then have done something that you can't do with the other research?

Dr. KREBS. Yes, it has a character.

SPALLATION NEUTRON SOURCE

Mr. MYERS. What about the talk now about the spallation source, what is that going to do for us?

Dr. KREBS. Well, a spallation neutron source will be a higher intensity neutron source that shoots. In a reactor, neutrons just sort of flow out, and you don't have it continuously. It is like a DC current, you know, just comes out, and as a consequence what you do, you can look at things in space. You can look at the spatial structure of things, but you can't necessarily see how things change in time. What the spallation neutron source does, because it basically spits out neutrons in spurts, and what we want are very short pulses, is enable you to look at things that are changing in time in a way that you can't with the reactor.

Obviously, if we could have built the reactor, we would have come up later to you for a spallation neutron source. The scientific community has told us we can do good science for you. We can solve important problems for you, and our judgment is that these are problems that are important to energy.

At the same time, we do believe that we can get a spallation neutron source for considerably less money than a reactor at this time, and still do good and important science for our missions.

Mr. MYERS. Three or four years from now after we have spent several millions of dollars, are we going to say, oh, well, we have got something better now, and that is spallation?

I tell the story about my dad. I always wanted a new car. The new cars came out, dad would say we have got to plant some crop. Well, cars come out in the fall, I guess. He said we have to harvest the crop to make sure we have enough money to pay for it. I would say okay, dad. About December we get the crop in. I would say now, dad, we can go buy a car. He said, well, now, we have got to pay taxes on a new car in March so we have to wait until after the 1st of March. March would come along, I would say, dad, let's go get the car now. I have been looking at cars downtown, kicking tires.

Well, now, son, you know, April we start planting corn again. We have got to make sure we have a little money to plant the crop. We get the crop planted, now we have to wait until the new model comes out, and he stalled me for several years that way. I said, dad, you have been doing me, haven't you? That is what this committee feels like, you know, you keep coming along, we spend money on this thing, then all of a sudden we got a new one coming on, so we will——

Dr. KREBS. We don't want to do it to you. This is an important issue obviously when I talk to my constituents in the scientific community.

Mr. MYERS. Well, you are right now.

Dr. KREBS. No, I talk to my constituents in the scientific community.

Mr. MYERS. We are out of that league, that is for sure.

SPALLATION NEUTRON SOURCE

Dr. KREBS. I try to describe some of the process that goes on. I have a view graph that says the President proposes and the Congress disposes. It is both trying to be humorous and very serious.

Mr. MYERS. This year the President proposes and the Congress opposes.

Dr. KREBS. Right. But this is the kind of thing, obviously that has been happening. I don't believe that we are going to come up with a new and different kind of source for neutron scattering, reactors or a spallation source. The view of the community has been pretty stable since probably the late 1970s that we need more intense neutron sources and a short pulse spallation source would be great. Then we can do interesting, important science.

I don't think that part is going to change. I do think that obviously budgets have been getting tighter and tighter, and, you know, at both ends of Pennsylvania Avenue I think there is a reluctance to really bite the bullet and move forward with these kinds of facilities. So I don't think we are going to say we should build something else, but I do think we need to work with you to decide whether or not we can build these.

A very important part of the science facilities initiative is running the two reactors we have got so that creative people can do important and innovative research. That is kind of my answer.

CONTINUOUS ELECTRON BEAM ACCELERATOR FACILITY

Mr. MYERS. Let's talk about CEBAF. What can you tell us about CEBAF?

Dr. KREBS. Well, CEBAF is beginning to run. We have the money to run it at a desirable level. I am not sure—I must admit I don't know what the Director of CEBAF would say, whether it is totally optimized from his point of view. I used to work with him at Berkeley so I feel that I can say this. It is with respect.

But, you know, we have tried within the framework of the facilities initiative to take care of these facilities, and CEBAF is a new one and we wanted to get going and to serve the nuclear physics community, so that is part of the initiative.

NATIONAL BIOMEDICAL TRACER FACILITY

Mr. MYERS. The biomedical tracer facility.

Dr. KREBS. Well, as you know, we received funding from the committee for 1994. We put out planning definition studies. We funded five planning definition studies at universities. Some of them had collaborations with national labs. We funded a report from the Institute of Medicine. The outcome of that report, to our reading, is that a new accelerator production facility for isotopes is desirable, and that we might consider it. They left open for consideration locating such a facility at possibly a national laboratory, and they affirmed the need for research and education investment, but not necessarily collocated with a production facility at a university. That is how I read the outcome from that. We have received the planning definition studies from the five universities, and we will review them by the end of this month.

We have asked the Brookhaven National Laboratory, where we have indeed upgraded or are in the process of upgrading an isotope accelerator, to do what I call a preliminary scoping study for what might, or how they might upgrade their facilities further in response to the Institute of Medicine study. We recognize the language from the committee's report in 1995, and we have extended the grants, I think is the right word——

I am reaching for proper words here—of the preliminary definition studies until June 15th. After we receive the Brookhaven study, we will then determine whether or not to extend those. So that is where we are. Why don't I leave it at that and let you say some more things.

Mr. MYERS. Maybe the Brookhaven study will answer my question. It has never been quite clear to me why we have to build a new reactor when some of the old ones apparently could do the job. It has never been quite clear.

Dr. KREBS. You are reaching a little bit beyond my familiarity. Obviously, the actual production of isotopes is carried out by the nuclear energy program, and there is a piece of——

Mr. MYERS. A lot of it is not being done right now. It is being done outside the United States. That is what bothers us.

Dr. KREBS. Indeed. I understand. There is a lot of the production that is associated with reactors. What you have asked us to do in the last couple of years is to look at those parts of the isotope production that might be carried out by accelerators, and, indeed, we think if it makes sense that we might be able to do an upgrade at Brookhaven. And my understanding is that there is some proposal associated with improved production of isotopes from reactors, too, but I don't think I should talk about it.

HUMAN GENOME

Mr. MYERS. Okay. Let's step into another area that we have already been discussing here, human genome. You have been doing a very fine job in collaboration with NIH and NCI. How about other foreign countries?

Canada had a breakthrough about a year ago or so, technically or scientifically, I might be using the wrong term, a mutation of a gene that they were finding the instance of cancer, one that is a particular, when a particular condition in a gene was there. Do you know anything about that?

Dr. KREBS. I don't know. I will try to find something out about it.

[The information follows:]

CANADA'S INVOLVEMENT IN CANCER GENE DISCOVERY

Two recent discoveries during the past 1½ years have contributed to our understanding of the development of colon cancer and breast cancer. A DNA repair gene that may be responsible for up to fifteen percent of all colon cancers has been identified. Another gene, BRCA–1, that contributes to susceptibility for breast cancer in some women, has also been identified. Scientists from Canada were collaborators in both of these discoveries: Jane Green, Memorial University of Newfoundland, for the colon cancer gene and Patricia Tonin and Steven Narod, McGill University in Quebec, for the breast cancer gene. Research at Brookhaven National Laboratory characterizing a related bacterial mismatch-repair gene contributed to the discovery of the colon cancer gene. DOE-funded research at the Eleanor Roosevelt Institute for Cancer Research also contributed to a key step in the identification of the colon cancer gene by providing chromosome microdissection libraries using technologies developed for use in the Human Genome Program. The discovery of the breast cancer gene was aided by the use of clones of human DNA provided by a DOE-funded investigator at the California Institute of Technology. Finally, Victor Ling of the Ontario Cancer Institute in Toronto has, in recent years, isolated and characterized genes that contribute to multidrug resistance of tumors, a serious problem in cancer chemotherapy.

ACCELERATOR PRODUCTION OF TRITIUM

Mr. MYERS. My wife has had three cancers, as you may know, so we have been following this very closely. I think you are doing great work here, working with the other agencies, which is very, very important, but again I guess some duplication is always necessary, and it is probably healthy, but the main thing that we do have a breakthrough, everyone knows it, that is what bothers me sometimes.

Speaking about the accelerator you just mentioned, what do you know about the accelerator production of tritium?

Dr. KREBS. Not much.

Mr. MYERS. We will get to that later.

Dr. KREBS. All I can say, let me make one comment, of course, because defense programs are proposing to explore the concept, to the extent that they explore it and we can take advantage of the research for the Spallation Neutron Source, we will do that. That is sort of the main thing. We are aware there is some similarity at the research level. We certainly don't want to duplicate.

Mr. MYERS. Going back to the human genome here. Two years ago we put money into the defense budget for cancer research, breast cancer particularly. What the intention of Congress was, we have a captive audience here where we know what they are eating, what's their environment, unlike the general population, we move around, we know when an individual in the military, what environmental impact, and what—so to have some control maybe, but they have gone further in the defense. They have a human tissue bank now. It would kind of relate, it would seem to me, with what you are doing. Are you aware of what the Department of Defense is doing?

Dr. KREBS. I am aware. I believe that there are some interactions. I would really have to get that information for you for the record because I don't have details.

Mr. MYERS. I suspect what will happen this year, we will not put the money in the defense budget, and if it is going to continue, if you do know something about it, provide it for the record.

[The information follows:]

DEPARTMENT OF DEFENSE HUMAN TISSUE BANK

The Office of the Assistant Surgeon General for Research and Development has indicated that the Army encouraged the development of fresh and frozen samples of normal and cancerous breast tissue and cell lines as part of the solicitation for research proposals for their Breast Cancer Initiative. Of the more than 400 proposals funded as part of this initiative, several include the development of such resources. The Department of Energy has no involvement with the funding or development of these resources.

TECHNOLOGY TRANSFER

Mr. MYERS. My last question, what you call utilization up there always bothers me, technology transfer. We are on the leading edge of research and development, but we have trouble, it seems like, getting it out to industry so they can use it.

Dr. KREBS. Well,——

Mr. MYERS. Maybe we will get into that a little bit in the afternoon.

Dr. KREBS. Dr. MacLachlan will have some real experience to relate to you.

Mr. MYERS. Forewarned now I guess, both of us.

Well, Dr. Krebs, thank you very much. We have held you quite some time here, but we are a half hour early at that. I am sorry more people aren't interested. They are, but we are spread so thin this year.

Dr. KREBS. I was looking forward to meeting the new Members.

Mr. MYERS. They would ask a lot more questions. We have gone over a lot of them, but I remember, when you get old you start talking—I was with the Chairman of the Agriculture Committee years ago, and he is gone now, but I asked a question. He said, no, we are not going to get into that. We have gone through that for years. I said, Mr. Chairman, I am a new Member here. Well, I guess that is right. We define ourselves here somewhat the same way.

We have pestered you today. Each year it seems like we kind of look at it in a different way, same programs, but you have broken up programs into subprograms which, again, bothers me somewhat, but——

Dr. KREBS. Well, I like coming up here. I think you need to know I am happy. I really like to talk about these programs, and I want you to support them and I want you to do the best things you can.

Mr. MYERS. Well, we appreciate your enthusiasm because that is the way, if you don't like your work you are not going to do a good job. So you are doing a good job. We have to do it more economically in the future, and I think we all recognize that. We do appreciate your testimony.

I think each of us has a series of questions we will provide for the record, so at this time, the committee will stand in recess until 2:00 this afternoon when you can change hats and come back. We are in recess. Thank you.

THURSDAY, MARCH 9, 1995.

FUSION ENERGY, SCIENCE EDUCATION AND TECHNICAL INFORMATION, AND TECHNOLOGY PARTNERSHIPS AND ECONOMIC COMPETITIVENESS

WITNESSES

DR. MARTHA A. KREBS, DIRECTOR, OFFICE OF ENERGY RESEARCH

TERRY CORNWELL RUMSEY, DIRECTOR, OFFICE OF SCIENCE EDUCATION AND TECHNICAL INFORMATION

ALEXANDER MacLACHLAN, DEPUTY UNDER SECRETARY, TECHNOLOGY PARTNERSHIPS AND ECONOMIC COMPETITIVENESS

Mr. MYERS. The committee will come to order.

This afternoon we are going to hear a panel of witnesses—Dr. Krebs, if you would like to introduce—but I guess primarily it is going to be fusion interests, then technology and so forth. Each of your statements will be placed in the record and then you may summarize or carry on as you care.

Please introduce your associates.

Dr. KREBS. I am accompanied here this afternoon by Mrs. Terry Cornwell Rumsey, who is the Director of the Office of Science Education and Technical Information; and Dr. Alexander MacLachlan, who is the Deputy Under Secretary for Technology Partnerships.

Mr. MACLACHLAN. Technology partnerships. It is a new job.

Mr. MYERS. That is what we are going to hang on you anyway, so we will live with that.

FUSION ENERGY

Dr. KREBS. I have a few comments to introduce fusion. As you are, I am, sure familiar, Mr. Chairman, fusion offers the potential of a safe, environmentally acceptable, virtually unlimited supply of energy. It is driven by a world view of what we might expect by the middle of the next century in terms of the general environment, as we look forward towards the middle of the next century, projections are that we will have 11 billion people in this world. If those people, predominantly in the underdeveloped countries, use energy at the same rate as we use energy in the developed world now, energy use would be triple what we currently use.

In large measure, we can envision competition for fuel that might induce national conflicts and certainly environmental damage, and fusion is basically an energy technology that would help us meet some of the challenges as we look forward to that period.

The U.S. has been at the forefront of fusion science and technology development. As you know, and I spoke about it this morning, we have had a year of outstanding successes and records in fusion power production. On the right-hand side is, in fact, an internal view of The Tokamak Fusion Test Reactor, when it was under some maintenance, and it is within that device that these fusion power records were achieved.

On the left-hand side is a graph that shows that the progress that we have made over the last 20 years in obtaining power from fusion, even on an experimental basis, has gone up faster, in fact, than the actual memory that can be stored on a computer chip. So in some senses, we are keeping pace in terms of generating fusion power on a pretty fast rate, although I know there has been concern about how fast fusion has been delivering.

Obviously there are plenty of challenges left with respect to fusion technology, and a lot of what is in the fusion program is driven by direction that we get from Congress in the context of the Energy Policy Act of 1992. At the same time, we have been faced with constrained funds in the program, and as a consequence, we have made choices to focus ourselves first on the International Thermonuclear Experimental Reactor, ITER, as a fully internationalized project and right now we are in the engineering design activities for ITER. We are working with our partners in a successful way, and we see ITER as the next step towards a commercial demonstration reactor.

In addition, we are concerned about maintaining the capability in the domestic program here in the United States, and that is why we have proposed the Tokamak Physics Experiment at Princeton that will also allow us to train the next generation of fusion scientists and engineers, involve industry, and lay the groundwork for an improved demo after we have the results from ITER. We are also engaged, as you know, in a review by the President's Council of Advisers on Science and Technology which will help us, I think, together, both the administration and the Congress, to guide the future of this promising technology.

As I closed with a quote this morning from Glenn Seaborg, I would like to close this afternoon with a quote from George Will.

Mr. MYERS. That is a big jump there.

Dr. KREBS. But he is a pretty wise guy, too. He says, "What, if anything, that happened in 1993 will stand in 2093 silhouetted against history's horizon? If history is understood merely as political history, perhaps nothing will, but there is much more to history than that. So perhaps a century from now, notice will still be taken of what happened around midnight on December 9, 1993 at the Princeton Plasma Physics Laboratory."

I think our challenge is to make sure that this is a moment of history that makes the difference, that truly makes a difference to probably our great, great grandchildren.

Mr. MYERS. Are you quoting from him now?

Dr. KREBS. No, no, this is mine. This is us. Our great, great grandchildren in the year 2093. Thanks.

[The prepared statement of Dr. Krebs follows:]

Statement of Martha A. Krebs,
Director, Office of Energy Research
Department of Energy
FY 1996 Appropriations Hearings

Mr. Chairman and Members of the Subcommittee:

I am pleased to be here today to present the Fiscal Year (FY) 1996 budget request for the Fusion Energy program supported by the Office of Energy Research.

The fusion program has made steady progress toward the goal of developing fusion as a source of electricity. The results from the program are at the cutting edge of both science and technology. The scientific discipline of plasma physics, for example, was established by the fusion program because it was needed for fusion development. Plasma physics is now used in a variety of other important areas such as understanding the near-earth space environment and its effects on communications.

Fusion Energy offers the potential of an environmentally acceptable, economically competitive energy source with a virtually unlimited and widely available fuel supply. Growing world population, industrialization of the developing countries, environmental degradation, concerns about the security and availability of present fuels, and the need to replace existing electric generating facilities led to the need for the development of fusion energy technology to support sustainable development. Development of fusion energy technology, however, requires a long-term commitment to a capital-cost-intensive and high risk development program, making development of fusion by the private sector impossible. Therefore, it is an appropriate role for the Federal government to assume responsibility for the development of fusion energy until the private sector can make reasonably informed decisions on whether and how to commercialize fusion.

In 1994, the Princeton Plasma Physics Laboratory's Tokamak Fusion Test Reactor generated a world record 10.7 million watts of fusion power.

In magnetic fusion, strong magnetic fields are used to confine the fusion fuels, deuterium and tritium, which are heavy forms of hydrogen. The research program is focused on how best to arrange the magnetic fields and how to heat, fuel, and maintain the purity of the fuel. The majority of effort in magnetic fusion research is focused on a donut-shaped device known as a "tokamak," the name given to it by its Russian inventors. The tokamak is the approach that, after many years of research, is judged to have the best chance of being made into a power plant. Recent experiments in the Tokamak Fusion Test Reactor (TFTR) located at the

Princeton Plasma Physics Laboratory (PPPL), have produced over 10.7 million watts of fusion power for a fraction of a second. This is a world record for the production of fusion power and it has provided the first opportunity to study the phenomena associated with energy release in the fusion device.

In inertial fusion, powerful beams of light or particles are used to heat and compress a pellet of fuel on a time scale so fast that the pellet does not have time to fly apart during the process. The research program is focused on understanding the interaction of these beams with the fuel pellet, and on the development of efficient, reliable particle accelerators. The science of the beam-pellet interaction is being carried out by the Office of Defense Programs The development of components for energy applications is being carried out in the Office of Fusion Energy and is limited to a single area, heavy ion accelerators, which is in its initial stage of development.

The Department has an established policy for the fusion program to conduct a goal-oriented fusion energy development program that would have a demonstration power plant operating by about 2025, and a commercial power plant operating by about 2040. In addition, the Energy Policy Act of 1992 calls for the program to conduct a technology demonstration of the practicability of commercial fusion energy by 2010. The Department's policy is based on a commitment to international collaboration throughout the program.

Because of the magnitude of the funding requirements for the development of fusion and because of the strategy to make major use of international collaboration, it is essential to establish a national commitment to the development of fusion energy in order to proceed effectively. To this end, and consistent with a Congressional request included in the Energy and Water Development Appropriation Conference Report for 1995, the President's Committee of Advisors on Science and Technology (PCAST) will evaluate the appropriate pace and direction of the fusion energy program. The fusion program described here will be modified, if appropriate, based on that review. This review is anticipated to be completed by the summer of 1995.

While the fusion program has made tremendous progress, there are still several major technical issues that must be addressed. The current magnetic fusion program strategy is focused on resolving these issues so that a tokamak magnetic fusion power plant can be operated to demonstrate that fusion is an economically competitive source of electricity. Four major activities have been identified as necessary to accomplish this objective.

The first activity involves the need to understand the physics of igniting and maintaining a "burning" plasma in a fusion power plant. In addition, a database for the design and operation of the components needed in a fusion power plant must be developed. Each of the world's major fusion programs has independently reached the conclusion that a large tokamak to address these issues should be the next step in fusion development. To this end, the European Community, Japan, the Russian Federation, and the U.S. have signed an agreement to do the engineering design and appropriate research and development for the International Thermonuclear Experimental Reactor (ITER). I will come back to ITER in a moment.

The second activity involves the development of advanced materials that will not become highly radioactive in a fusion power plant environment. The international community has agreed that the development of advanced materials requires the building of a materials testing facility that will produce an intense beam of neutrons at energies typical of those in a fusion power plant.

The third activity is the development and testing of the component needed to extract the energy from the fusion reactions in a manner that can be used to generate electricity. This component, commonly referred to as the "blanket," also contains material that is converted to tritium, for additional fusion fuel, when exposed to the neutrons from fusion reactions. This new fuel is then recycled into the power plant to keep it operating. Several different types of blankets would be tested in ITER after the completion of the work required for the first activity I described.

The fourth activity addresses the need to improve the power plant embodiment of fusion. The Tokamak Physics Experiment (TPX) will offer a unique opportunity to develop the scientific basis for a continuously operating, cost competitive demonstration power plant by making it smaller, more efficient, and, thus, less expensive to build and operate than would otherwise be possible. The TPX, which could be operating before ITER, would contribute to improved operation of ITER, when ITER is conducting the part of its mission that requires continuous operation for engineering testing. TPX would also provide the benefit of helping to maintain a strong domestic program so that the U.S. would be able to take advantage of the information learned in the design and operation of ITER. In building the TPX, U.S. industry will gain valuable experience that will allow it to successfully compete with industry abroad for the large contracts that will be established for the construction of ITER.

Underpinning all of these activities is the supporting physics and enabling technologies. The former includes medium and small-scale tokamak experiments, diagnostics, theory and modeling, and a small amount of work on non-tokamak options. The list of enabling technologies being developed with DOE funding includes the development of magnets, vacuum systems, heating and fueling systems, heat-resistant materials, and other auxiliaries required to implement experiments.

The purpose of ITER is to demonstrate the scientific and technological feasibility of fusion. ITER would be the first fusion device ever to achieve the sustained burn of a deuterium-tritium plasma. It would provide a test bed for the technologies needed to build and operate a demonstration electrical power plant.

The ITER Engineering Design Activities (EDA) began in July 1992 and will be completed in July 1998. The scope of the EDA provides for the design of ITER and the associated research and development so that this information will be available to the four ITER Parties to use as part of an international collaborative program to construct ITER or to use in their own domestic programs.

The ITER Council, which provides overall direction and supervision of the EDA, acted in mid-1994 to appoint Dr. Robert Aymar of France as the new Director. The Council also appointed Dr. Robert Iotti from Ratheon Ebasco as Administrative Officer. These appointments, together with other key management changes, are aimed at improving the EDA efficiency and effectiveness.

The next major milestone for the EDA is preparation, by June 1995, of the Interim Design Report, which will provide detailed cost and schedule estimates for ITER construction, as well as site requirements. This report will be reviewed thoroughly by the Parties and will strongly influence the Parties' views on whether and how to proceed with planning for ITER construction.

The ITER Parties have not yet made a commitment to ITER construction. U.S. participation in the construction and siting of ITER will require a major policy decision that goes beyond technical issues and considers economic benefits, personnel and financial resources, and safety and environmental issues, as well. As part of developing a U.S. Government position on these issues, the Department is engaged in discussions within the Administration and will continue to consult with Congress.

Returning to our domestic program, the Department plans to construct TPX at PPPL, using the TFTR building and much of its existing auxiliary systems. This approach would make efficient use of the significant investment that has already been made in developing a fusion research capability at PPPL. The TPX will provide the basis for the design of more compact and economically competitive fusion power plants. Based on current assumptions of annual funding levels, the Total Project Cost of TPX is estimated at $742.0 million (in as-spent dollars) with project completion late in 2001. Once completed, it would be the only large U.S. tokamak operating in the early years of the 21st Century and would serve as the mainstay for our domestic fusion program in support of ITER. As I indicated earlier, actual construction of TPX will await the results of the PCAST review.

The TPX and ITER would enjoy a productive synergism. TPX would be the first tokamak in the world to use superconducting magnets in the geometry similar to that planned for ITER. TPX would benefit from the planned ITER research and development. ITER, in its nuclear testing phase, would benefit from the information developed in TPX.

Another goal of the fusion energy program is to involve U.S. industry more directly in order to facilitate the transfer of fusion technology to the industries that will ultimately design, build, and operate fusion power plants. To this end, both ITER and TPX include industry partners in all aspects of design and research and development.

The Inertial Fusion Energy program strategy, separate from the present science-based stockpile stewardship program of the Office of Defense Programs, will direct its effort to the development of energy-specific components. Because of its high efficiency, anticipated reliability, and high repetition rate, a heavy ion accelerator has been consistently identified as the best driver candidate for inertial fusion energy. The principal requirement is the ability to focus the driver ion beam to a small, high-intensity spot in order to reach the radiation energy required to ignite the target.

In summary, inertial fusion energy has considerable promise, but depends on science and technology development that is carried forward for other purposes. A goal-oriented inertial fusion energy development program would not be appropriate for about a decade after the presently planned program provides fundamental information on physics and the driver.

FY 1996 FUSION ENERGY BUDGET REQUEST
Budget Authority in Millions

Energy Supply R&D Fusion Energy	FY 1994	FY 1995	FY 1996 Request
- Operating Expenses	311.2	356.1	299.4
- Capital Equipment	15.5	10.3	12.5
- Construction	1.9	2.0	54.1
Subtotal Fusion Energy	328.6	368.4	366.0
- Less General Reduction	- 6.4	- 2.1	-
Total Fusion Energy	$ 322.2	$ 366.3	$ 366.0

A more detailed budget table is provided in the Appendix.

The Administration recognizes that significant budgetary commitments are required to meet the previously stated goals. The review of the fusion programs by PCAST and the Office of Science and Technology Policy will include an examination of U.S. participation in ITER construction and the role of the planned TPX facility.

The FY 1996 budget request for Fusion Energy is $366.0 million. The request includes $299.4 million for Operating Expenses, $12.5 million for Capital Equipment, and $54.1 million for Construction. The request supports four essential program elements for magnetic fusion energy, including participating in the engineering design phase of ITER, initiating construction of the TPX, continuing a base program of physics and technology support, and initiating the safe shutdown and decommissioning of the TFTR facility following the completion of the ongoing experimental program. In addition, support continues for development of inertial fusion components for energy applications, including initiating construction of the Elise, a heavy ion accelerator facility at Lawrence Berkeley Laboratory.

The Operating Expenses budget for the Fusion Energy Program is allocated among six subprograms. For the Confinement Systems subprogram, $131.5 million is requested for Operating Expenses. This request provides for the safe shutdown of the TFTR facility and the beginning of preparations for removal of the tokamak. Scientists from the TFTR program will begin collaborative efforts on other tokamak facilities in the U.S. and abroad and will complete the analysis of data from the deuterium-tritium experiments. Research and development and prototype development for the TPX project will continue, but at a reduced level as construction activities begin. The TPX is designed to lead to an improved tokamak power plant and to increase the U.S. ability to contribute to and benefit from the ITER program. The TPX will be used to develop operating techniques that would permit design of smaller, less expensive tokamak power plants. It will provide the scientific basis to move from operating times of one or two seconds to the continuous operation needed for an attractive fusion power plant. The total increase in funding for TPX of $20.1 million over the FY 1995 level is more than offset by a decrease in funding for TFTR of about $26.4 million.

The DIII-D tokamak experiment at General Atomics and the Alcator C-Mod tokamak experiment at the Massachusetts Institute of Technology will be operated to provide information for the design and operation of ITER and TPX. DIII-D will focus on experiments using more efficient techniques to "drive" current in high-pressure plasmas. Alcator C-Mod will study techniques to confine high density plasmas using a "magnetic divertor" to handle the power and particles coming out of the plasma and interacting with the walls of the vacuum chamber, one of the most critical issues faced in the ITER design. In addition, we will continue activities to shut down the Princeton Beta Experiment (PBX-M) at PPPL. Some U.S. scientists will continue to be involved in international collaborations to keep abreast of developments on alternate confinement concepts, such as reversed field pinches and stellarators, since major work on these concepts has been terminated in the U.S. but is being continued abroad.

The Operating Expenses request of $48.8 million for the Applied Plasma Physics subprogram would support experimental and theoretical research to improve the understanding of fusion physics principles and to investigate innovative techniques leading to improved plasma confinement conditions. This subprogram supplements research in the Confinement Systems subprogram by developing and using new diagnostic systems, developing plasma heating and control concepts, and producing basic scientific data necessary to design and conduct power plant-scale fusion experiments. A significant portion of this activity is focused on improving the understanding of how energy and particles are lost from the plasma by mechanisms that "transport" them across the magnetic fields that confine the plasma. We will continue to support the development of new diagnostic tools for use on ITER and TPX and also small-scale studies on selected non-tokamak fusion energy concepts. About one-half of these activities are carried out by universities. Fusion computing and operation of the central computing activity at the Energy Research Supercomputer Center at Lawrence Livermore National Laboratory are also supported under this subprogram.

The request of $100.4 million of operating funds for the Development and Technology subprogram is primarily for the support of U.S. participation in ITER. The funding requested for ITER is to provide the U.S. share of the EDA phase of the project, which includes the engineering design, supporting technology research and development, and development of model components that could be scaled up to full size. The costs of hosting the San Diego Co-Center for the ITER Joint Central Team are covered, as well. This subprogram also supports a base technology program to develop magnets, heating systems, blankets, and materials for existing and planned experiments. Funding is also included for the long-range development of advanced materials that will not become highly radioactive during service in the power plant, thereby enhancing safety and simplifying waste disposal. Fusion system studies will continue to evaluate the commercial applications of fusion power.

The FY 1996 Operating Expenses request also includes $3.1 million for the continuing research and development in the Inertial Fusion Energy subprogram. The primary effort will be focused on the physics of heavy ion acceleration. This program will rely on the continuing development of inertial fusion target physics and ignition characteristics information supported by the Department's Defense Programs' budget. Where possible, international cooperation will be pursued to speed overall progress in inertial fusion energy.

The Operating Expenses request also provides $9.6 million in Program Direction funds for the salaries, benefits, travel and other expenses associated with 82 full-time equivalents required to administer the Fusion Energy program by the Headquarters staff and those at Department of Energy Operations Offices; and $6.0 million in the Planning and Projects subprogram primarily to support the program's legal obligation to the Small Business Innovation Research Program.

The FY 1996 Capital Equipment request of $12.5 million provides for procurement of essential hardware to support the overall program. This includes diagnostic and computer equipment, power supplies, and other components which are essential for conducting research on our experimental facilities. Support for the upgrade of the DIII-D facility to increase its experimental capabilities will continue.

Of the $54.1 million in FY 1996 Construction funds, $49.9 million is required for the TPX project to complete Title I design activities, begin Title II design, and procure long-lead materials

Budget Authority in Millions

Energy Supply R&D - Fusion Energy (Construction Summary)	TEC	FY 1995	FY 1996 Request
- Elise (96-E-310)	20.2	0.0	3.2
- Tokamak Physics Experiment (94-E-200)	610.0	0.0	49.9
- General Plant Projects (GPE-400)	N/A	2.0	1.0

Total Fusion Energy Construction		$ 2.0	$ 54.1

and superconducting magnets. In addition, $3.2 million is provided to initiate the Elise project, a linear heavy ion induction accelerator facility that will produce intense ion beams to test many of the features of a heavy ion induction accelerator driver for inertial fusion energy production. The remaining $1.0 million is for General Plant Projects, which provide for the continuing minor alterations and modifications necessary to meet health, safety, and programmatic requirements and to protect the Government's investment in its facilities.

This concludes my statement. I would be happy to answer your questions.

Appendix
Energy Supply R&D
Fusion Energy
Budget Authority ($ in millions)

	FY 1994	FY 1995	FY 1996 Request
Operating Expenses			
Confinement Systems	$ 163.2	$ 187.8	$ 131.5
Applied Plasma Physics	57.2	54.3	48.8
Development and Technology	78.0	89.0	100.4
Planning and Projects	0.0	7.4	6.0
Inertial Fusion Energy	3.9	8.0	3.1
Program Direction	8.9	9.6	9.6
Subtotal	$ 311.2	$ 356.1	$ 299.4
Capital Equipment	$ 15.5	$ 10.3	$ 12.5
Construction	$ 1.9	$ 2.0	$ 54.1
Subtotal Fusion Energy	$ 328.6	$ 368.4	$ 366.0
Less General Reduction for Use of Prior Year Balances	- 6.4	- 2.1	-
Total Fusion Energy	$ 322.2	$ 366.3	$ 366.0

OFFICE OF SCIENCE EDUCATION AND TECHNICAL INFORMATION

Mr. MYERS. Mrs. Rumsey.

Ms. RUMSEY. Thank you. Good afternoon, Mr. Chairman and members of the subcommittee. With the Chairman's permission, I would like to provide the subcommittee with an overview of my testimony, and I would also like to provide my full testimony for the record.

I am pleased to appear before you today in support of the administration's budget request for the Office of Science Education and Technical Information. With over 20 national laboratories and facilities, the Department of Energy has the largest scientific research and development system in the world. It offers the expertise and collective genius of over 30,000 scientists and engineers, including 33 Nobel Prize winners.

This unique scientific and technical capability establishes the foundation for the Department to significantly contribute to the national education goals and provide easy access to useful information. Because of our internationally renowned research facilities and their work, the Department is uniquely qualified to make valuable contributions in math and science education. These world-class facilities and intellectual resources are the basis for increased knowledge. This knowledge gives the American people a real competitive advantage.

Our office has the capability and responsibility to provide leadership for effectively managing throughout the Department science education and technical information programs which contribute to this knowledge.

Given the national education priorities and fiscal realities, we have refocused our efforts to give the American taxpayers a greater return on their tax dollars. Through newly developed tools and management techniques, we provide leadership and guidance throughout the Department. As a consequence, we have a results-oriented and effectively managed science education and technical information program.

Well-managed scientific and technical information is a competitive asset that we use to acquire worldwide energy information essential for the success of the United States' industrial and research communities. By partnering with our colleagues across the Federal Government, such as the National Science Foundation, and the Department of Education, we invest in initiatives designed to have lasting, meaningful impact. By emphasizing performance measurements and outcomes, we advocate long-term math and science education reform which will make the United States number one in math and science education.

Recent studies show there are not enough Americans pursuing careers in scientific disciplines to meet the needs of the United States in future global markets. This is one of the most serious challenges facing the Nation because skills grounded in math and science education enable our citizens to succeed in the information age. By improving math and science education for all Americans throughout the learning continuum, we open new vistas of knowledge and preserve our leadership in science and technology in the global economy.

No other agency has the technological expertise and facilities to meet this education challenge. The technical knowledge of our scientists and engineers is second to none. The Department is using information technology science education program activities to make a difference in the lives of our citizens, particularly our young people.

An educated population in which every individual's contribution is acknowledged and respected is our best guarantee for a prosperous future. This Nation cannot afford to waste its most precious resource, our people, their ideas, and their work.

EDUCATION INVESTMENTS

The Department of Energy, through this office, is ensuring that the United States is positioned to compete and win. By using our $72.9 million to capitalize on the Department's multibillion dollar investment in scientific and research activities, we are providing teachers with new and improved instructional tools and experiences, we are delivering high quality science instruction through technology, and we are expanding public access to useful, worldwide scientific and technical information.

We have had considerable success in delivering measurable results. Please let me share a couple of examples with you.

First, our strategies support long-term math and science education reform. The Bay Area Science and Technology Education Collaboration, BASTEC, in the Oakland, California Unified School District is developing an interdisciplinary curriculum for use in all schools from kindergarten through the 12th grade. To develop this curriculum, BASTEC uses the expertise of laboratory scientists at the Department's Lawrence Berkeley, Lawrence Livermore, Sandia, and Stanford accelerator center. This reform effort leads to quantifiable improvements in the school system's curriculum, instructional and assessment methods which will continue long after this collaboration is over.

Two thousand science and math teachers who work with 55,000 students in the school district have benefited from these programs. At a recent conference, a teacher told us that as a result of her involvement in this program, she has improved the way she teaches science to her class.

Second, we invest in programs using technology to bring the thrill of scientific discovery to students across the Nation. Consider our hands-on universe program. This program gives students access to equipment like high-powered telescopes and state-of-the-art facilities. In fact, this past summer, two middle school students in Pennsylvania discovered and named a new Super Nova in the whirlpool galaxy. This would be a measure accomplishment for any experienced astronomer. Their discovery has led these two young women to explore careers in science.

Next, studies show students in rural and urban communities lag significantly behind national norms in math and science achievement. By partnering with the Department of Education, we have positioned the Office to ensure these youngsters benefit from innovative science, education initiatives using leading edge technology. In short, we have concentrated our resources in the areas of greatest need.

Finally, our strategies focus on enhanced access to information. We developed the Department of Energy's Home Page on the Internet which provides electronic access to the Department's resources. Usage of Home Page has increased dramatically as evidenced by over 16,000 connections per month since last fall.

Further, through the open net information system which we also developed we have publicly announced over 260,000 previously classified or restricted documents. Usage of this system is also increasing. Over 5,000 customers have used the system, and that rate is steadily climbing by 35 percent per month since October.

We have reduced our fiscal year 1996 budget request by 15 percent from the fiscal year 1995 level. Through better management of our programs and by leveraging our resources, we provide the American taxpayers a greater return on their investment.

This concludes my testimony, and I will entertain any questions you might have.

Thank you.

[The prepared statement of Mrs. Rumsey follows:]

STATEMENT OF TERRY CORNWELL RUMSEY,
DIRECTOR OF THE OFFICE OF SCIENCE EDUCATION AND TECHNICAL INFORMATION
DEPARTMENT OF ENERGY
FY 1996 APPROPRIATIONS HEARINGS

Good morning Mr. Chairman and members of the Subcommittee. I am pleased to appear before you today in support of the Administration's budget request for the Office of Science Education and Technical Information. With over 20 national laboratories and facilities, the Department of Energy has the largest scientific research and development system in the world. It offers the expertise and collective genius of over 30,000 scientists and engineers, including 33 Nobel prize winners. This unique scientific and technical capability establishes the foundation for the Department to significantly contribute to the national education goals and provide easy access to useful information.

OVERVIEW

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Given the national education priorities and fiscal realities, we have refocused our efforts to give the American taxpayers a greater return on their tax dollars. Through newly developed tools and management techniques, we provide leadership and guidance throughout the Department. As a consequence, we have a results-oriented and effectively managed science education and technical information program. Well-managed scientific and technical information is a competitive asset used to acquire worldwide energy information essential for the success of United States industrial and research communities.

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Recent studies show there are not enough Americans pursuing careers in scientific disciplines to meet the needs of the United States in global markets. This is one of the most serious challenges facing the nation because skills grounded in math and science enable our citizens to succeed in the Information Age.

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The Department is using information technology and its science education program activities to make a difference in the lives of our citizens, particularly our young people. An educated population in which every individual's contribution is acknowledged and respected is our best guarantee for a prosperous future. This nation cannot afford to waste its most precious resource - our people and their ideas and their hard work. The Department of Energy, through this Office, is ensuring that the United States is positioned to compete and win.

ACCOMPLISHMENTS

By using our $72.9 million to capitalize on the Department's multi-billion dollar investment in scientific and research activities, we are providing teachers with new and improved instructional tools and experiences, delivering high quality science instruction through technology, and expanding public access to useful world-wide scientific and technical information.

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We have reduced our FY 1996 budget request by 15% from the FY 1995 level. Through better management of our programs and by leveraging our resources, we provide the American taxpayers a greater return on their investment.

FY 1996 UNIVERSITY AND SCIENCE EDUCATION BUDGET REQUEST

The FY 1996 budget request of $55.4 million for University and Science Education programs will provide continued support for university faculty/student research appointments, increase the diversity and number of participants in precollege education programs at the Department's laboratories, and continue our laboratory rural/urban partnerships program. Further, the program will continue the development and implementation of management tools and systems to ensure the soundness of our investment.

The Laboratory Cooperative Science Centers subprogram, with a request of $30.0 million, will provide support for comprehensive programs at the Department's laboratories that have regional and local impacts, including rural/urban school partnerships. The request provides for (1) summer and semester-length research appointments for undergraduate science, mathematics and engineering students; (2) summer and academic year appointments for university faculty and graduate students; (3) support for precollege students and teacher research appointments, including the prestigious Department of Energy High School Science Students Honors Research and Teacher Research Associates Programs. Further, the budget request includes continued support for the National Education Supercomputer Center at the Lawrence Livermore National Laboratory. The supercomputer is used by precollege teachers and students from junior high school through community college for advanced studies in math and science. Funding is also requested to support 11 four-week teacher training institutes to be conducted at federal laboratories. And we are shifting some of our resources in FY 1996 to support school-to-work transition education which includes technical apprenticeship programs at the Department's laboratories and joint programs between community colleges using Department laboratories and facilities.

The University Programs subprogram with an FY 1996 request of $17.4 million will continue to provide cost-shared support for the Prefreshman Enrichment Program. In this program 7,000 middle school students nationwide participate in summer workshops on mathematics, science and engineering conducted on university campuses. The subprogram will continue to provide partnering support for the development of travelling museum exhibitions and related classroom educational materials. Analyses of manpower in energy-related fields are also supported, as are projects designed to encourage rural and urban community participants to pursue careers as math and science teachers. Recognizing that Historically Black Colleges and Universities, Hispanic Serving Institutions, and Native American Institutions have a role to play in ensuring full participation of all Americans, we will continue to support those programs.

The University Research Instrumentation subprogram, with an FY 1996 request of $5.6 million, is also directed at strengthening the nation's science education infrastructure. This subprogram, when combined with other similar Departmental programs, helps university scientists to conduct long-range research on solving energy problems. This competitive annual program involves substantial cost sharing from the institution receiving the equipment. It will assist universities in purchasing instruments that cost over $100,000. In turn, the purchased instruments will be used by a number of researchers, including graduate students. We will continue to place special emphasis on innovative instrumentation needed to carry out advanced research on selected energy-related topics areas.

Program Direction funding will be used for Federal staffing and associated support costs to provide overall management of the Science Education and Technical Information Program, including the Office of University and Science Education.

FY 1996 TECHNICAL INFORMATION MANAGEMENT PROGRAM BUDGET REQUEST

The FY 1996 budget request provides for a total of $17.5 million for the Technical Information Management Program. This request contains funding for federal salaries and benefits to manage the Department's centralized program, including the negotiation and execution of bilateral and multilateral international agreements for the exchange of scientific and technical information. It also includes policy coordination and services to acquire and evaluate scientific and technical information, to develop, build and maintain automated systems, and provide the broadest possible access to the Department's scientific and technical information. Finally, the request provides for funding the operation of the facility located in Oak Ridge, Tennessee, and the second year of a three-year construction project to upgrade the facility.

An increase of $1.5 million over the FY 1995 budget is provided in the FY 1996 budget request. A $1.0 million increase in operating funds allows for avoidance of further adverse impacts on the accessibility and timeliness of the Department's scientific and technical information following a seven year period of no escalation. The increase provides resources to meet minimal requirements for expanding public access and enhancing economic competitiveness through the effective use of information. The request also provides a $0.5 million increase in construction funds to complete the second phase of a three-year project to renovate the heating, ventilating, and air conditioning systems and remove friable asbestos at the Office of Scientific and Technical Information facility. These improvements will ensure the protection of the Department's scientific and technical information collection; uninterrupted operation of the supporting computer systems; and continued upgrade to the facility to comply with environment, safety, and health regulations.

U.S. Department of Energy
Office of Public Affairs
Washington, D.C. 20585
202/586-3640

BIOGRAPHY

TERRY CORNWELL RUMSEY

- Named by President Clinton on July 22, 1993, to be the Director of the Office of Science Education and Technical Information.

  As Director, she develops policies and administers programs that fully utilize the Department's research and development programs, facilities, laboratories and other resources to support the national objectives for science, mathematics and engineering education. She is also responsible for the management and dissemination of the Department's scientific and technical information and serves as a member of DOE's Leadership Council.

PRIOR EXPERIENCE

- Ms. Cornwell Rumsey joined the Department of Energy after a 17 year career at the Xerox Corporation. Her experience at Xerox includes organizational and systems information management, sales, marketing and strategic business planning. From 1990 to 1993, she served as Manager of Policy and Government Affairs in Xerox's Washington office. During her career at Xerox, she became an expert in Total Quality Management (TQM) and has lectured on the application of TQM.

PERSONAL

Born:	December 3, 1954, Bridgeport, CT
Education:	B.A. in psychology, Cum Laude, Spelman College, Atlanta, GA
Family:	Married to William H. Rumsey, Jr., one son, William H. Rumsey, III

- Ms. Cornwell Rumsey is former President and founding member of the International Alliance of Professional Women, which promotes the positive development of children and empowerment of women as business and civic leaders. She belongs to several professional and civic organizations, including the National Council of Negro Women.

February 1995

Printed with soy ink on recycled paper

Mr. MYERS. Well, thank you, Mrs. Rumsey.

At this point, there is a vote underway on the House Floor. Your testimony is so important this afternoon, we all three want to hear it. Ordinarily we alternate, but your testimony is so important on the future energy needs of the country, so we will stand in recess for about 10 minutes while we go do our constitutional duty.

[Recess.]

Mr. MYERS. The committee will come to order.

We would be pleased now to hear from Dr. MacLachlan.

OPENING REMARKS

Dr. MACLACHLAN. Mr. Chairman and members of the Energy and Water Development Subcommittee, I am pleased to be here today. I am submitting my testimony, my written testimony, but I would like to make a few comments.

The office that I am currently heading was formed last summer in the Department of Energy from an existing office that had the responsibility to manage and improve the processes by which the Department entered partnerships with the private sector, but it became apparent as we grew in these that the issues that faced the Department could really be better solved with more of a corporate overview, and this office was formed and reports to the Under Secretary.

It was also determined that the new office ought to be headed up by a person with industry experience and a person with experience in R&D management and issues, and I was offered the job and accepted it and came on board in the fall and have been there ever since.

The office budget totals $3 million for fiscal year 1996, the request. That consists of $2 million for the people and about a little less than $1 million for the expenditures of activities that the office carries out for the Department. I would like to say how really pleased I am to be here and to be able to work with my colleagues in the Department of Energy and also with you, the Members of Congress, on what I think is a very important activity.

Now I took the job because I believe that we have a great opportunity to make the research universities, the government labs and industry work together more effectively, and if we do this right, government and industry will be able to do their jobs cheaper and faster and better, and I believe our technology system will continue to be the envy of the world.

I would like to make three points today. The first is that technology partnerships between the Department of Energy and American industry and academia, when properly initiated and managed, can provide enormous benefits to the public.

The second point is that we are rapidly improving the processes by which we form and manage these partnerships to get the benefits.

And then finally, my third point is that I think we are just beginning to tap the potential.

VALUE OF PARTNERSHIPS

Now, partnerships benefit the government labs and industry partners far more than the sum of the parts. To be sure, both parties save money by doing the research together rather than separately, but more importantly, both partners gain from the access to each other's facilities, brain power, know-how, and I would say even cultures.

My views about the value of these partnerships are based on long experience. Prior to coming to the Department of Energy, I spent almost 37 years at DuPont with the last eight as senior vice president and chief technical officer. Every day we at DuPont faced a similar task that is faced by the Department of Energy today and that is how to keep on the leading edge of a whole variety of new technologies which are necessary to do our businesses, which we really could not—we were becoming less and less able to afford.

Even as the expense of exploring and developing new technology increases, global business pressures, as you know for a lot of industries, are forcing us to cut costs and shorten our time horizons. We, as well as many other industrial companies, began to look at partnerships with other companies, with universities, and Federal laboratories as a way to help. I would say the government labs were a special interest, principally because they are in many ways similar to industry, yet they are not competitors.

Labs develop products and process, they work in multidisciplinary teams, and they have many of the basic technology needs as some of the industry. The opportunity to work with them was enabled by Congress' bipartisan effort since 1980 to make technology in the labs available for use by the private sector.

Let me just give two examples, although they are small ones, to illustrate how working together gives much better results than going it alone.

The first is a collaboration that enabled us to stop making our own custom grinding devices for ultra precise optical components for lasers. Los Alamos National Laboratory, teamed with the Moore Tool Company, a small Connecticut-based firm, to help them manufacture the grinders, and as a result Los Alamos was able to purchase them and get out of the business, and the Moore Tool Company benefits through increased sales but, more importantly, they now can offer this technology to a much broader commercial market. The Nation benefits from a growing high tech business and a lower cost producer of products that are needed for the industry, the laser industry.

My second shows an even broader partnership. CTS Corporation of Elkhart, Indiana is one of 10 companies that are working with Sandia National Laboratory and several other government agencies to eliminate the use of environmentally objectionable solvents for the cleaning of complex electronic circuit boards. All the partners benefit from their shared pool of knowledge and all the partners, including the Department, avoid redundant expenditures that they would otherwise have to make.

Both these examples illustrate that we achieve better and faster results by working together on demanding problems.

MANAGING PARTNERSHIPS

The second point I would like to make is that we are learning how to select and manage these partnerships effectively. Our early challenge, and one we talked about a lot over the years, was to change the culture of the labs to encourage collaboration. I can tell you a great deal of progress has been made. One illustration of this is the fact that we now have over 4,000 partnerships and over 1,200 of these are Cooperative Research and Development Agreements, CRADAs, which alone are valued at about $2.2 billion with about 60 percent of this coming from industry. Our challenge now is to ensure that these new partnerships provide the maximum return to the Department and to the taxpayer.

The recent report by the Task Force on Alternative Futures for the Department of Energy's national labs, called the Galvin report, suggested some helpful corrections. The report strongly supported partnerships with industry that enhance our core congressional mandated missions. The report did express concern about the potential for partnerships to divert from missions, and we are addressing this concern by issuing clear criteria for partnership formation. The Galvin report encouraged these efforts. They were aware of this.

The criteria that we are selecting derived really from five principles. First, they have to support department missions; second, they must have the potential to yield economic and other national benefits; third, they must define up-front measurement and accountability standards; fourth, they have to be formed in a fair and open manner; and finally, we have to manage them by using best business practices.

That last principle, best business practices, is an important part of our management philosophy. My office is working with all relevant organizations within DOE and other outside groups to identify these and to speed their adoption throughout the Department. For example, we implemented a modular CRADA that helped reduce agreement processing time by 50 percent, and we are now working on best practices, how to help us track and improve the performance of partnerships, and to be more effective and efficient in intellectual property rights negotiations.

We are also looking at our portfolio of partnerships. We do have many excellent collaborations with individual companies, but we want to work more and more with industry sectors, especially those that have developed road maps that describe common future technology needs.

When an industry has identified its future needs, it is easier to find common interests and form highly productive partnerships. Our partnerships with small businesses, a sector that contributes so much to the vitality of this Nation, is also a focus of our selection activities and is growing strongly.

CONCLUSION

My last point is that we have really just begun to tap the potential. Industry and the laboratories are only now learning how to work together effectively and to break down the cultural barriers and the not-invented-here syndrome. I believe the great value we are already seeing is really only a harbinger of what is possible if we stay the course and if we have the courage to experiment with new ideas and don't avoid mistakes but learn from them, and I want to thank you for your attention.

[The prepared statement of Dr. MacLachlan follows:]

Statement of Alexander MacLachlan,
Deputy Under Secretary for Technology Partnerships
Department of Energy
FY 1996 Appropriations Hearing

Mr. Chairman and Members of the Subcommittee, I appreciate the opportunity to submit a statement of the Fiscal Year (FY) 1996 Congressional budget request in support of the Department of Energy's technology partnership programs.

INTRODUCTION

My testimony has four purposes: to define the goals of the Department's technology partnership programs with the private sector; to demonstrate the tremendous value these partnerships bring to the Department and to the private sector; to demonstrate how the Department is improving its procedures and business practices to make it easier to partner with us; and, to describe the responsibilities and budget of my office.

I have only been with the Department of Energy for a few months. Prior to coming to the Department, I spent 36 years with the DuPont company, the last eight as a Senior Vice President for R&D. During this time I also served as a Director of the Industrial Research Institute (I.R.I.), which has as its members the research heads of more than 250 of the most technology intensive companies in the United States.

The challenges facing the Department of Energy are similar to those facing private companies. Both need to continually make R&D more cost effective at a time when R&D is continually becoming more expensive. As technology increases in complexity, both can no longer afford to be at the leading edge of all of the technologies that they need. Moreover, both need to show results to their stakeholders in the near-term while sustaining capabilities for the long-term.

In both private companies and in the Department of Energy, a solution to these problems is to collaborate with others in order to share costs and technologies. During my last few years with DuPont, we recognized that it was often no longer feasible to conduct high risk research and development alone and we rapidly expanded our technology partnerships. Initially, we focused on the more familiar partners: other companies and universities. Universities in particular were interested in expanding relationships in new and novel ways. By far the most exciting opportunity for partnering, however, was with the government laboratories.

While the laboratory culture and the bureaucracy were barriers, we saw the Department of Energy laboratories with their outstanding scientists and engineers and magnificent state-of-the-art facilities as having many of the characteristics of the ideal partner. The laboratories deliver products and processes, meet deadlines, excel at forming multi-disciplinary teams, and keep abreast of new technology that also is of potential interest to industry. Moreover, the laboratories are non-competitors and yet have similar cost constraints that lead them to seek partners to help with their mission needs.

Although my colleagues at the I.R.I. and I all had initial misgivings about working with the government and found early partnerships to be difficult, I believe industry is now convinced of the benefits of working with the laboratories. Industry is still just beginning to incorporate these partnerships as part of their strategy, and is nowhere near using these partnerships to their full potential.

The Department of Energy and itslaboratories are in a similar position. Congress recognized more than a decade and a half ago that partnerships could be a way to leverage resources in support of government missions and simultaneously bring value to the private sector by making technologies developed in the national laboratories available to the private sector. Because this was a new way of operating and required significant culture change in the national labs, it has taken time to become effective. To aid the process, Congress and the Executive Branch over the past 15 years have built a statutory and administrative framework designed to facilitate technology partnerships. I believe this framework, built on a bi-partisan basis, is enabling partnerships that are beginning to provide great value to the Nation.

GOALS OF TECHNOLOGY PARTNERSHIP ACTIVITIES

When entering into partnerships, we follow five simple principles: partnerships must directly support departmental missions; they should have the potential to provide economic and other benefits to the Nation; they must be formed in a fair and open manner; 'best business practices will be used; and the results must be measurable. Those principles support the primary goal of the Department of Energy's technology partnerships, which is to provide value to the taxpayer by directly supporting our missions and yielding economic and other benefits to the Nation.

During my short tenure at the Department of Energy, I have gained a strong appreciation for the differences that drive private sector and government decisions to enter into technology partnerships. The private sector is driven by the need to survive in today's tough global market place. This means having the lowest costs and best quality products, conforming to an ever more stringent environmental and regulatory climate, and delivering an acceptable return to the stockholders. Similar pressures affect the Department of Energy, although they are viewed in different terms. The parallels, however, create the basis for partnerships. In fact, these partnerships are so natural and beneficial, it is a wonder that we did not seek to use them much earlier.

What do I mean when I refer to technology partnerships? The best known examples are the Cooperative Research and Development Agreements (CRADAs), but there are a number of other ways the Department partners with the private sector. These include the licensing of our technologies, personnel exchanges, technical assistance, science training programs, use of our specialized facilities, and doing work funded by non-federal organizations. The actual arrangements range from industry sector partnerships like the Partnership for the New Generation of Vehicles (PNGV), and the High Performance Computing and Communications Initiative, to individual company CRADAs that are valued from $50,000 to several million dollars to one day technical assistance with a myriad of small and start-up companies all over the U.S.A.

By accessing capabilities and talent found in the private industry, the Department lowers the cost of our exploratory R&D, keeps our vital technological capabilities at the leading edge, and helps ensure we have an industrial base for our future needs. At the same time our industrial partners gain identical benefits, thus freeing vital capital to improve their competitiveness or getting faster access to new technological options to produce superior products and processes. A few examples illustrate the benefits for both government and industry:

* Los Alamos National Laboratory teamed with Moore Tool Company, a small Connecticut-based company, to develop a new method to polish optical surfaces. The Department is now able to purchase machine tools with a higher capability as a way to replace custom-built -- and expensive -- fixtures used before. This increases the ability of Los Alamos to produce affordable, high-quality parts for lasers and other instruments used in departmental research projects. Moore Tool Company benefits by staying one step ahead of its competition.

* Oak Ridge National Laboratory and Sandia National Laboratories have joined with ten companies in a CRADA to develop a commercial system for curing large-sized polymer-matrix composite structures using electron-beam technology instead of heat. Solving this difficult technical puzzle would put U.S. companies on the cutting edge of world aerospace markets because electron-beam curing is faster, simpler and more environmentally-friendly than conventional curing processes. The Department benefits because national security requirements often call for large composite structures, such as airplane fuel tanks and aircraft wing elements.

* Work done by the Pinellas Plant, located in Florida, and Life Sciences, Inc., a Florida-based minority-owned small business, has led to the development of a field portable chemical analyzer that integrates optoelectronic sensors into an existing platform and data processing package. A prototype of the sensor was introduced in November 1994 and will ultimately be used by the Department during site remediation work.

* Seattle Specialty Ceramics is working through a CRADA and a licensing agreement to develop Pacific Northwest Laboratory's glycine nitrate process to manufacture new ceramic powders on a commercial basis for use in fuel cells and related technologies. The ceramic powders are critical to the current and future needs of developers and manufacturers of multicomponent solid-oxide fuel cells. Fuel cells are a promising technology that benefit the Department's energy efficiency and environmental missions.

Ensuring that we stay focused on our mission was one of the principal recommendations made by The Task Force on Alternative Futures for the Department of Energy National Laboratories when it released its report on February 2nd. The report, now known as the Galvin Report, made the following recommendation:

> *"The government-funded technology transfer/industrial competitiveness activities of the national laboratories should be focused on industries and areas of technology that contribute directly to the DOE's missions of national security, energy and the environment".*

We support this recommendation fully.

The report also identified some activities of the Department that were "unfocused" and could "distract the DOE and its laboratories from their public mission." The report acknowledged that it was aware of actions already underway by the Department to correct these shortcomings and commended those efforts. I will now address those efforts because they show how we are taking aggressive steps to improve our technology partnerships. The key, as recognized by the Galvin Report, was to provide a sharp focus to our technology partnerships.

Putting it simply, we want to ensure that all of our partnerships are first and foremost supportive of our missions. When we are able to work with industry sectors or individual businesses in partnership to accomplish our mission we know that the taxpayer's R&D investment is being leveraged. We also know that the industry partner would not waste resources and facilities to work with us if they did not feel the collaboration was in their best interests.

Are we helping industry by entering into partnerships? Of course, but the government benefits as well by gaining access to industry capabilities and brainpower we could never get by going it alone. Our industry partner also gains in competitiveness and the ability to provide jobs. This is a good deal both ways for the taxpayer. How do we make sure our partnering activity really works this way? Let me describe.

We are developing a range of performance measures. These performance measures are derived from criteria we have developed for partnership formation. The first criteria is benefit to mission. Clearly this must be our primary focus. Consequently, we must choose partners that have the best capability to help us. Sometimes these may be individual companies, but more and more we are finding that it is wise to try and work with industry sectors that have collaborated to develop "roadmaps" that describe common future technology needs. When these needs overlap ours, possibilities for highly productive partnerships can emerge. This type of partnership also fits our second criteria, which is to strive for maximum economic impact as a derivative of our partnership activities.

THE VALUE OF TECHNOLOGY PARTNERSHIPS

We know that a significant portion of the CRADAs entered into by the Department with large companies and our major partnerships, such as the Partnership for a New Generation of Vehicles (PNGV) are really pushing us to the limits of our capabilities in an array of critical scientific and engineering areas. These include massive computing challenges, new materials, complex fabrication technologies, specialized analytical capabilities and many others. This clearly shows we are working with industry in basic and new knowledge development, rather than on products or services that will soon emerge into the marketplace. It demonstrates we are sharing the cost of doing basic and applied research of the most exacting variety, exactly where it makes the most sense to collaborate.

One of the most convincing statistics that support the value of these partnerships is the surge in repeat business we've experienced **[see attached, Chart #1]**. People would not keep coming back to us if they didn't see value. In addition, our partnership activities over just the last two years have been increasing rapidly. CRADAs have increased three-fold from January 1993 to mid-February of this year **[see attached, Chart #2].**

We also have indicators that demonstrate that the private sector sees great value. The strongest of these is the total investment of the private sector that is already involved in these partnerships.

Currently, almost 60% of the CRADA investment, or $1.2 billion comes from our industry partners **[see attached, Chart #3]**. One interesting perspective on this level of activity can be gained by looking at the total current U.S. industry R&D spending of about $80 billion. My experience at DuPont and at I.R.I. leads to the conclusion that no more than 5% of that $80 billion is spent on basic and new knowledge research. The rest is spent on short-term product and process improvements that can impact the bottom line in the relatively near-term. This is a necessity in today's fast moving highly competitive business world The longer term effort amounts to only about $4 billion. This means that the Department's CRADA activities alone, which amount to over $355 million annually, encourages more than 5% of that new end each year.

We have other strong indications that the work being done in partnership with industry is in dynamic growth technology areas. We know, for example, that a great deal of work is being done in advanced materials and instrumentation, information and communications, and advanced manufacturing **[see attached, Chart #4]**. The number of multi-party CRADAs that tackle an industry-wide challenge are increasing **[see attached, Chart #5]** and we know from past experience that those types of partnerships almost by definition are at the high-risk new technology end of the R&D spectrum.

In addition, the diversity of our CRADA partners is increasing **[see attached, Chart #6]**, which is important to us as a Department. Since January 1993, the number of CRADAs with minority-owned firms has increased 6-fold and CRADAs with universities have tripled, from

25 to 76. The most dramatic growth, however, has been with small businesses, which have jumped from 98 in January 1993 to more than 440 as of today.

And that's only the CRADAs. The other 3000 plus partnerships we have with large and small companies, academia and other members of the private sector also have a significant component of high-risk, high-payoff R&D. As I mentioned previously, we partner with the private sector in a number of different ways. Those other partnership mechanisms lead to literally thousands of interactions every year between our scientists and industry technologists.

From all of this activity we have seen a strong growth in patents issued, license income and companies formed. **[See attached, Table #1]** We do not yet have a comprehensive picture of the benefits enjoyed by our partners because much of the R&D we are talking about is basic research and new knowledge development. This kind of effort has a longer time frame than the more incremental product and process improvement activity that makes up the vast majority of industrial research. What we can be sure of, however, is that we are always trying to work on the high pay-off end and the result will ultimately be more strong and long lived companies and jobs.

Other early indicators for economic value also exist. The Department of Energy is in the process of studying what happened to departmental technologies that won prestigious "R&D 100" Awards issued annually by Research & Development Magazine since 1963. We found that the Department has won more R&D 100 Awards than any other government agency and in the last five years this had led to 60 product commercializations from partnerships with the private sector. Several of these products led to entirely new companies. In addition we have a growing number of businesses forming that are based on our technologies.

One of the most interesting of these company's derived from highly sophisticated software we developed for a mission-related task. This company has continued to improve the software as they tried to serve ever more complex customer needs. This has now led to a far more effective product than we had initially developed and we are now using their product instead of continuing to expend our resources. We call the initial formation of a new company a spin-off activity, and the return of future technology benefits back to the government as a spin-on activity. We are seeing more and more of this type of a direct return of the original investment to the taxpayer: an increase in our ability to do our Congressionally-mandated work, and a boost to the economy through new industrial activity.

Could industry afford to do this much without us? I doubt it. My experience in industry taught me that it was often critical for government to share risk in new high technology areas rather than to try and convince the company CEO to go it alone. Even if industry would pursue some of these areas, it probably would not be of the quality we now have through the blending of personnel, knowledge and facilities that our partnerships offer.

And the government benefits from the partnership in the same way. This kind of partnering in the pre-competitive stages of new knowledge development is having an enormous impact in a key area that is substantially at risk in today's world. This is really a win for the taxpayer because it results in collaborations that enable us to achieve our missions and provide a powerful impetus to industrial competitiveness. What's more, it is all industry driven so we know we are putting our effort where the market tells us we will make the biggest impact.

BECOMING A BETTER PARTNER

I mentioned earlier that industry found initial interactions with the government difficult. This has changed dramatically during the last two years. The determination to make us a better partner was a commitment spelled out in the Department's Strategic Plan, entitled "Fueling a Competitive Economy." In addition, our technology partnership efforts have been guided by a 1993 planning document, "Partnerships for Global Competitiveness", which spelled out a series of steps we would take to improve our ability to partner with the private sector.

We have met or exceeded all of the goals we set for ourselves, which included reducing by 50% the time it takes to form a CRADA, developing special outreach programs to small business, and changing the culture in the labs to encourage partnering with industry. We previously documented the many changes we have made in our partnership activities in the report, "Our Commitment to Change", which was published in August 1994 and distributed to members of Congress at that time.

To ensure continued improvement, we are asking our industry partners for feedback through meetings around the country with industry participants and most recently through a customer satisfaction survey that delved specifically into our business practices and sought suggestions for areas where improvement was needed. We were gratified by our overall approval rating of over 80%, which I am told was quite surprising for such a survey.

From this survey and our national feedback meetings, we know we still have a significant way to go. We still are much too slow and bureaucratic when entering into some types of agreements, our patent and licensing policies are inconsistent across our labs, and we are not as easily accessible to small businesses as we need to be if we are going to fully avail ourselves of this dynamic and creative segment of the high technology industry. In addition, our fee structures and financial business practices are impediments to working with industry, especially small businesses.

We are determined to respond to this advice and will need a lot of help from the Congress if we are to be successful since many of the improvements requested by our partners require legislative action. But the effort is worth it. Developing these types of partnerships with the private sector is a relatively new activity for the Department of Energy. In many respects we can look back on the last 3-5 years as a time when we were developing an experience base from which to go forward and improve. We think we are fairly well along on the learning curve and with the wisdom that hindsight provides, can see many mistakes that we made. We also think we have developed many excellent and effective processes that lead to good partnerships and will build on that legacy in the coming months.

RESPONSIBILITIES OF THE OFFICE OF TECHNOLOGY PARTNERSHIPS

The Department of Energy has an essential role to play in assisting U.S. economic competitiveness as a result of its unique laboratory system and research and development (R&D) capabilities. In addition, the Department has expertise in many areas that are critical to major high-technology industries and services, and to reconciling economic and environmental goals. The Department's role has evolved over time as a result of major legislation, including the Stevenson-Wydler Technology Innovation Act (P.L. 96-480) (1980) and continuing through the Energy Policy Act, Title XXX (P.L. 102-486) (1992).

The Office of the Deputy Under Secretary for Technology Partnerships was organized in June 1994 to draw together and provide a corporate-level focus on the Department's vast and expanding array of partnerships with the private sector. The mission of the Office is to exercise responsibility for department-wide integration, planning, and evaluation of partnerships between the Department and the private sector. The Office plays a critical role in advancing and promoting technology partnerships involving resources of the Department and its laboratories and facilities.

Toward this end, the Office facilitates the coordination and strategic planning of departmental programs, policies, and budgets to promote economic growth and job creation. The Office also serves as the departmental focal point and facilitator for technology partnerships with industry and with other government agencies. The role of this Office in technology partnerships differs from that of program offices like Energy Research and Defense Programs in that we do not have a budget to enter into partnerships. Rather, our role is to work with program offices to ensure that the partnership process is efficient and brings maximum value to the Department and the Nation.

Major activities of the Office include:

- Managing the development of DOE's strategic plan for technology partnerships, including the selection of major partnerships, and their budget requirements;
- Serving as the departmental focal point for technology partnership activities and policy issues with OMB, OSTP, other agencies, Congressional staff and outside groups;
- Analyzing domestic and international policy developments and issues affecting partnerships between the Department industry and other partners;
- Coordinating Department-wide activities to improve technology partnership processes, and develop metrics and other information to assess the benefits resulting from the Department's technology partnerships; and,

Developing and conducting Department-wide outreach, communication and training activities which provide the private sector with information about technology partnership opportunities within the Department.

Attached separately is the FY1996 budget request for the Office **[see attached, Table #2]**. Given the Office's expanded responsibilities, as compared to the predecessor Office of Technology Utilization in the Office of Energy Research, our FTE's will increase from 18 to 19 in FY95. Our FY96 operational budget request of $983,000 is the same as FY95 and will be used for outreach activities (publications, exhibitions, etc.), conferences, performance measurement development and other key responsibilities of the Office.

CONCLUSION

My hope and expectation for the Department's technology partnership program is to be able to walk into any of the Department's laboratories or facilities a few years hence, and talk with people who cannot imagine any other way to do business except through partnerships with universities, companies and other private sector organizations. I am sure we will see that in our companies. If we reach that point, and I believe we are well on the way toward this, we will be the envy of the world. Our global competitors will try to emulate our partnership model, but will find it difficult because they simply do not have the same resources.

We have made a tremendous investment in our national laboratories during the past 50 years. We won the Cold War, in part through their efforts. During the next 50 years our national laboratories and facilities will be a cornerstone of a unique public/private partnership that accomplishes vital national missions, such as national defense, while at the same time contributes to the nation's economic well being.

■ Repeat Customers for DOE CRADAs

As of 2/28/95

There are 25 individual participants who have 6 or more CRADAs with DOE:

	# of CRADAs
Allied Signal	7
Aluminum Company of America	6
Amoco	13
AT&T	12
Babcock and Wilcox	6
Boeing	6
Chrysler Corp.	6
CRAY Research	13
Cummins Engines	11
Dow Chemical	10
Dupont De Nemours	14
Electric Power Research Institute	7
Ford Motor Company	7

	# of CRADAs
General Electric	12
General Motors	55
Hewlett-Packard	13
Intel Corp.	8
IBM	17
Lockheed	6
3M	8
Motorola	8
Schlumberger	8
SI Diamond Technology Inc.	6
Texas Instruments	6
United Technologies	16

Chart 1

Increasing Number of DOE CRADAs

1,212 as of 2/28/95

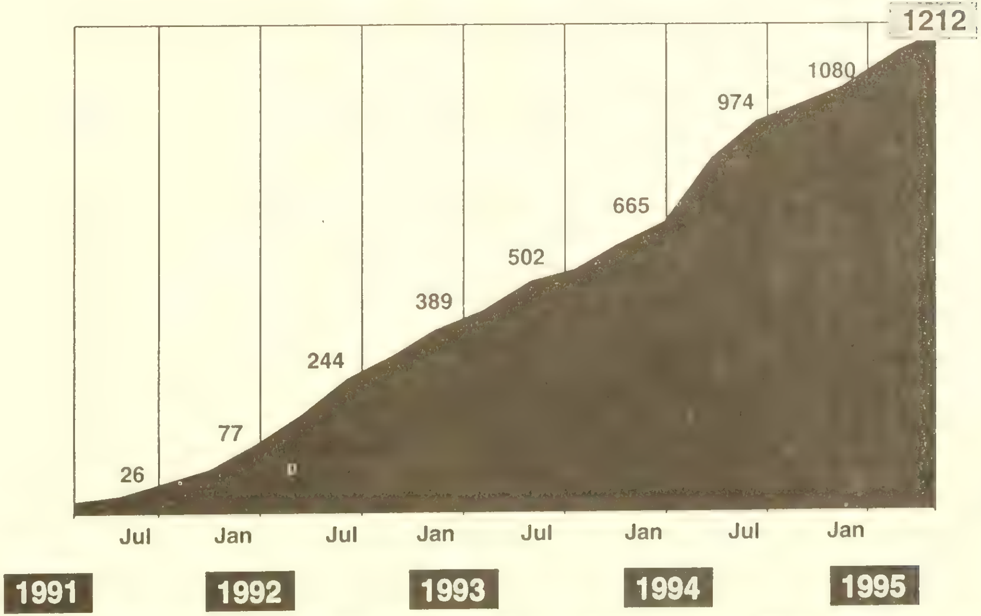


Chart 2

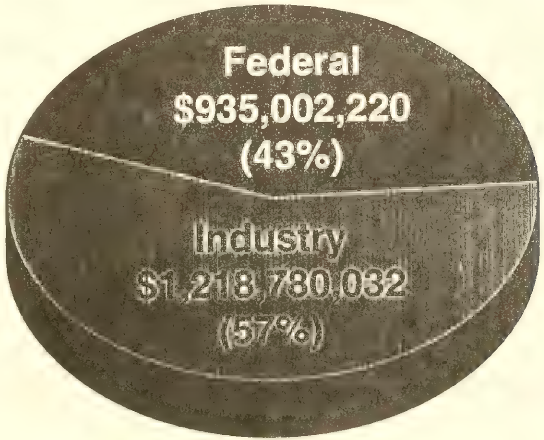
■ Selected Partnership Facts and Figures

	# of FY 1994 Achieved	# of FY 1995 Estimated	# of FY 1996 Projected
Invention Disclosures	1,588	1,758	1,886
Patent Applications	569	662	712
Non-Exclusive Licenses Awarded	470	575	662
Exclusive Licenses Awarded	37	61	82
Income from Licenses	$2,915,000	$3,455,000	$4,598,000
Companies formed	17	32	47
Non-Federal Cash-in from CRADAs	$90,954,000	$121,562,000	$138,958,000
Federal Investment in all Partnerships	$1,571,765,000	$1,834,546,000	$1,896,776,000

Table 1

■ DOE CRADA Public/Private Investment

As of 2/28/95

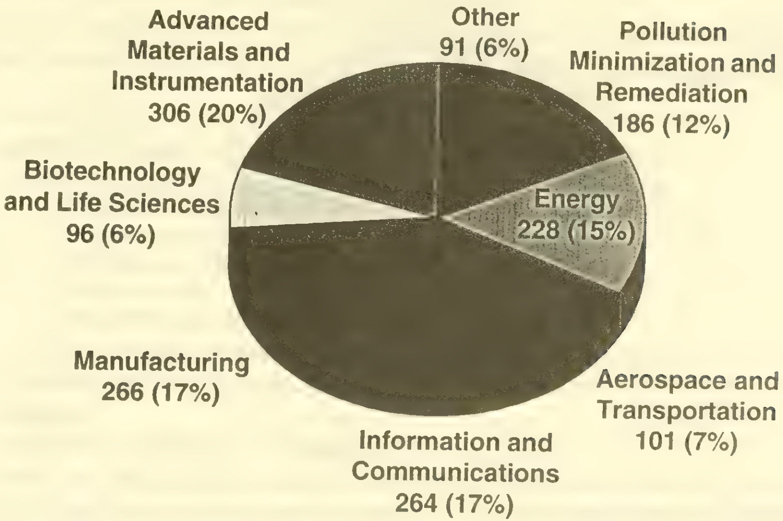


Total $2,153,782,252

Chart 3

■ DOE CRADA Distribution by Technology Category*

1,212 as of 2/28/95



* Percentages may not equal 100% due to rounding.
CRADAs classified by primary category; however, many CRADAs fall into more than one category.

Chart 4

Large Partnerships, Consortia, and Other Multi-Party DOE CRADAs

As of 2/28/95

- There are currently 7 major multi-party partnerships with the DOE:

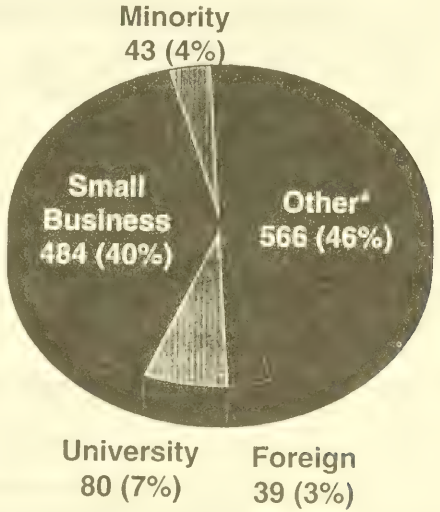
Appliance Research Consortium, Inc.	2
AMTEX	28
California Institute for Energy Efficiency Sponsors	25
U.S. Council for Automotive Research (USCAR; includes:)	36
U.S. Advanced Battery Consortium (7)	
Environmental Research Consortium (3)	
Vehicle Recycling Partnership (1)	
Low Emissions Technologies R&D Partnership (24)	
Supercomputing Automotive Applications Partnership (1)	
Motor Vehicle Manufacturing Association of U.S.A., Inc.	2
National Center for Manufacturing Sciences (NCMS)	9
SEMATECH	5

- The collective value of these 107 CRADAs is over $300 million. They enjoy a 56% industry cost share, compared to the overall 57% industry share of the total 1212 CRADAs.
- These 7 partnerships collectively account for 8.8% of all CRADAs, and just over 14% of the total value of all CRADAs.

Chart 5

■ Diversity of DOE CRADA Participants

1,212 as of 2/28/95



* "Other" includes large and medium businesses, consortia, industry groups, etc.
Industry participants may fall into more than one category

Chart 6

DEPARTMENT OF ENERGY
FY 1996 CONGRESSIONAL BUDGET REQUEST
ENERGY SUPPLY, RESEARCH AND DEVELOPMENT
(Tabular dollars in thousands, narrative in whole dollars)

LEAD TABLE

Technology Partnerships

Activity	FY 1994 Adjusted	FY 1995 Appropriation	FY 1995 Adjustment	FY 1995 Adjusted	FY 1996 Request
Operating Expenses					
Technology Partnerships	$0 a/	$0 a/	$0	$0 a/	$983
Program Direction	0 b/	0 b/	0	0 b/	2,170
TOTAL	$0	$0	$0	$0	$3,153
Staffing (FTEs)	b/	b/		b/	19

Authorization: P.L. 95-91, "Department of Energy Organization Act" (1977), Section 209

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a/ Formerly funded as the Technology Utilization, a subprogram of the Laboratory Technology Transfer program, Office of Energy Research.

b/ Formerly funded in Advisory and Oversight Program Direction, Office of Energy Research.

DEPARTMENT OF ENERGY
FY 1996 CONGRESSIONAL BUDGET REQUEST
ENERGY SUPPLY, RESEARCH AND DEVELOPMENT
(Tabular dollars in thousands narrative in whole dollars)

SUMMARY OF CHANGES

Technology Partnerships

FY 1995 Appropriation	$ 0
- Adjustment	0
FY 1995 Adjusted	$ 0
- Support for Technology Partnerships program, previously funded as the Technology Utilization subprogram of the Technology Transfer program, at the FY 1995 level	+ 983
- Provides support for 19 FTE's previously funded in Advisory and Oversight Program Direction, Office of Energy Research	+ 2,170
FY 1996 Congressional Budget Request	$ 3,153

U.S. Department of Energy
Office of Public Affairs
Washington, D.C. 20585
202/586-3640

BIOGRAPHY

ALEXANDER MACLACHLAN

Alexander MacLachlan was appointed Deputy Under Secretary for Technology Partnerships by Secretary of Energy Hazel O'Leary on December 11, 1994.

Dr. MacLachlan will oversee the Department of Energy's technology transfer and cooperative research and development programs. In that capacity he will be responsible for facilitating partnership agreements, developing criteria for forming them, and establishing performance measures and quality control processes.

Dr. MacLachlan retired at the end of 1993 from DuPont after more than 36 years of service. He was Senior Vice President for Research and Development and a member of DuPont's Operating Group from 1990 to 1993. He had oversight for the company's $1.2 billion research program and line responsibility for the company's corporate science and engineering laboratories, toxicological facilities, central research laboratories and services and new business development.

From 1986 to 1990, as Senior Vice President for Technology, he was responsible for corporate research and oversaw the company's research and development programs and the Information Systems and Engineering Departments. From 1982 to 1986 he was Director of the companies Central Research and Development Department.

Dr. MacLachlan's career with DuPont was spent largely in research management, including head of research for DuPont Germany, but also included significant business assignments. He headed DuPont's worldwide printing products businesses and a new venture devoted to commercialization of membrane technologies. He first joined DuPont in 1957.

He graduated from Tufts University in 1954 with a B.S. in chemistry, Dr. MacLachlan earned his Ph.D. in 1957 at the Massachusetts Institute of Technology in physical organic chemistry with a minor in chemical engineering. He is a member of the Phi Beta Kappa Society. His early research at DuPont led to fifteen scientific papers and four patents.

(more)

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Dr. MacLachlan's management accomplishments include establishing DuPont's Aid to Education Program in Europe and the Far East, founding the DuPont Fellows organization, creating the DuPont Technology Council, which deals with research and development issues across the company, starting the annual Lavousier Award for research and engineering accomplishments in support of business success, and setting up a seed funding program to support individuals' ideas for improvements to DuPont businesses.

He has also served as a director of the Industrial Research Institute, a member of the Fermi Board of Overseers, a trustee of the Bartol Institute at the University of Delaware, and as a trustee of the Mt. Cuba Astronomical Observatory. He was elected to the National Academy of Engineering in 1992 and in 1994 was awarded Dupont's Pederson Medal.

Dr. MacLachlan and his wife Betty have four children and five grandchildren. His hobbies include golf, gardening, drawing, art and carpentry.

February 1995

Mr. MYERS. Well, thank you. I apologize. I understand there is going to be a vote every 20 minutes, so I think we have to give up on the hope that we all get to hear what you have to say.

Mr. Bevill.

SCIENCE EDUCATION

Mr. BEVILL. Thank you, Mr. Chairman.

Mrs. Rumsey, I wanted to ask you, what is the importance of the Department of Energy—what important role does the Department of Energy play in the Nation's science education efforts?

Mrs. RUMSEY. I would say tremendous because, as I have mentioned earlier in the testimony, of the Department's multibillion dollar investment that we make in the national energy laboratory system, which is comprised of over 20,000 of the world's best scientists and engineers, state-of-the-art facilities, and equipment. We have a huge contribution that we can make to improving the Nation's performance in science and math from kindergarten all the way up to and through postgraduate. The programs partner with educational institutions in many instances to help them accomplish their missions by bringing in students and faculty to work side by side with these world-class scientists and engineers to solve mission-related problems.

EXPERIMENTAL PROGRAM TO STIMULATE COMPETITIVE RESEARCH

Mr. BEVILL. EPSCoR was originally designed and created by the National Science Foundation partly in response to the desire of this committee to stimulate better research and increase the ability in States that traditionally have lacked strong university-based research efforts to compete for Federal research support. This Congress authorized an EPSCoR program at the DOE in the Energy Policy Act of 1992.

Would you provide a status report on the DOE's EPSCoR program?

Mrs. RUMSEY. Certainly. In the funding level for 1994 through the Department, which was absorbed by the Office of Science Education and Technical Information, amounted to $7 million. For fiscal year 1995, the budget is approximately $6 to $6.5 million, and the 1996 request is $2.1 million.

Mr. BEVILL. You might want to expand on that more for the record.

Mrs. RUMSEY. I would be happy to, certainly.

[The information follows:]

DEPARTMENT OF ENERGY/EXPERIMENTAL PROGRAM TO STIMULATE COMPETITIVE RESEARCH (DOE/EPSCOR)

As of FY 1995, only the fifth year of the DOE EPSCoR program, seven of the 19 EPSCoR states have received research implementation awards of up to $1.25 million; 13 have received graduate student traineeship awards that range from $220,000 to $950,000; and all 19 have received planning awards of approximately $100,000.

The FY 1996 funding request for the program is $2.1 million. Subject to a satisfactory progress review, the requested funding will be used to sustain the activities of the three states that began their research implementation programs in FY 1994, albeit at a reduced rate. At this level, no new research implementation awards will be funded in FY 1996.

Already apparent in the EPSCoR states are a variety of infrastructure building activities and interactions that will enhance these states ability to better compete for federal research support in the future. This progress is evidenced by formulation of faculty from different universities combining their resources to mount larger research efforts; collaborations between the academic community, federal agencies and industrial partners; and the state legislatures and governor's offices becoming involved in efforts to develop strategic plans to use state resources to support a science and engineering infrastructure within their states.

DOE is also benefitting in a number of ways. Because the DOE EPSCoR program has been structured to encourage collaboration between the Department's national laboratories and the academic community, significant outside expertise is being directed toward studying energy-related research questions. Further, as the program places heavy emphasis on the involvement of students in the research activities of the participating faculty and laboratory staff scientists, DOE is developing a talented, diverse future workforce needed to accomplish its mission.

FUSION ENERGY

Mr. BEVILL. Dr. MacLachlan, I just wanted to welcome you. We are pleased to have you here. This is your first appearance, and we are looking forward to working with you.

Dr. Krebs, I ask this every year and you would be disappointed if I didn't ask you. The Chairman and I had a meeting with all the fusion people from all over the world, here at the Capitol, and we asked them how long is it going to be before you have a breakthrough. They said, they were all excited, we are going to have a breakthrough in 25 years, that is understandable, they didn't expect the Chairman and I to be around 25 years later.

I asked them again, I said, how long is it going to be before you have a breakthrough. They said 25 years. This was 25 years later. I said, how long is it going to be before you have a breakthrough. They said 25 years. Well, it is a great program, really. I am looking for a breakthrough in the next 25 years.

Dr. KREBS. Do you want me to comment? I will be quiet.

Mr. MYERS. Do you think we will still be here in 25 years? He will be?

Dr. KREBS. I plan to be. Not in this job.

Mr. BEVILL. Strom Thurmond and I both plan to be around here.

Mr. MYERS. I am going to bet on him.

Dr. KREBS. Can I make one comment?

Mr. BEVILL. Sure, I would like to hear you testify. You do a good job.

Dr. KREBS. I would like to say that I think we have had a breakthrough. I mean, I think the record of achievement at the TFTR over the last year has really been a breakthrough in the sense that we have demonstrated that we could do what we said that machine was going to do.

We have also been able to show through the exquisite instrumentation that is available on that machine, that we not only can control but we can actually see what is happening, and I think it prepares the way to work with you to get the levels of funding that are going to be required to deliver on what we think we can do in the future. But I think this is an important decision that we share.

Mr. BEVILL. Thank you.

Thank you, Mr. Chairman.

Mr. MYERS. Thank you, Tom. Carrying on——

Mr. BEVILL. I do have several other questions, but I am going to put them in the record. We are going to be voting here.

Mr. MYERS. In your response to Mr. Bevill, you said if we were able to fund it. Your request this year, the administration's request for fusion is down.

Dr. KREBS. I think there were some hard choices that we had to make. It is only moderately down. Basically, I think it is $2 million below what was in the 1995 enacted level. It is basically constant with what we asked for last year.

Mr. BEVILL. They did the best of anybody I know, just $2 million.

PARTNERSHIP FOR NEW GENERATION OF VEHICLES

Mr. MYERS. I don't know, we have some that have gone the other direction on us. I will go back to the morning presentation. I meant to ask you about this partnership for a generation of vehicles, a new generation of vehicles. Tell us what that is, would you, please.

Dr. KREBS. Well, actually I think Dr. MacLachlan could help out here as well, but essentially the Department of Energy, as you may know, is part of a government-wide effort to work with the automotive industry in order to obtain a dramatically improved manufacturing of automobiles as well as an improved performance.

I think the strategic target is, by somewhere in maybe 2002, 2005, I can't remember to be perfectly honest, to have a three-times improved efficiency automobile with the same level of amenities as, say, we have now. Since I think there have been investments in the Department since 1993, in 1995 you are seeing for the first time a request in the basic research programs for the partnership, and some direct funding, explicit funding for laboratory tech transfer activities in the civilian laboratories.

Mr. MYERS. Are we still talking about a petroleum-fueled vehicle or are we talking about a different type of engine, something?

Dr. KREBS. You want to talk? You talk, Alex.

Mr. MACLACHLAN. Anyway, the engine is not specified, it can be any of a number of things, but it has to be affordable in today's terms or, obviously, it is not going to be commercial.

Mr. MYERS. That is something new in itself.

Mr. MACLACHLAN. Right. The fuel, at least the fuel goal is expressed in petroleum equivalents. It doesn't say it has to be gasoline or something like that, but who knows?

Mr. MYERS. Well, sorry. The committee will stand in recess until someone else comes back. Whoever is here first, start. I apologize.

[Recess.]

FUSION ENERGY

Mr. FRELINGHUYSEN [presiding]. Dr. Krebs, good afternoon, all of you again. Sorry things are so disjointed, but I guess that is the way life is down here.

Let me just ask, if I can, to Dr. Krebs a few general questions. Earlier this week, Secretary of Energy O'Leary said that progress— she used the term dramatic to describe the progress in the Fusion Program and that she was committed to the program. That made some of us up here feel pretty good.

Can you tell me and the committee why is fusion energy such a difficult scientific challenge?

Dr. KREBS. Well, essentially fusion is the energy source in stars, and in large measure, I think what you are trying to do here on earth is to replicate and contain that energy source which usually occurs in stars here on earth. It is not an easy challenge, trying to figure out how to confine that kind of an interaction in an environment where people, ordinary people can live and work. That is what the fundamental challenge is, and it is not simple. It requires, you know, either things like magnetic confinement systems or inertial confinement systems and it takes a lot of both fundamental understanding and technology development to have them.

Mr. FRELINGHUYSEN. Speaking for myself, I think it is important that we engage our constituencies in the need to understand fusion energy and its role in our Nation's future.

Can you give me some sense of the long-term energy needs of this country and how much investment the Department is making in long-term energy research?

Dr. KREBS. What I don't have right off the top of my head, I think I am going to have to provide that for the record. I don't mean to be—it is clear that there is a lot of detail.

Obviously, the Department of Energy is looking at the next 10 to 50 years in terms of its investments in energy technologies. The ability to project out into the middle of the next century is not easy. Earlier, I spoke about looking at energy needs not only in this country but from a global perspective, and also looking at energy needs from the perspective not simply of providing energy that fuels the economy, but also a form of energy that is attentive to what the environmental consequences are.

Clearly the Department sees a need to invest in improved energy efficiency technologies, in all of the sectors—residential, industrial, utility, and transportation—and the overall investment in energy, if you include fusion, is probably in excess of $2 billion, but I would have to provide the details for the record.

I would also like to have the opportunity, at least for the purposes of thinking about it domestically, to get you some more detailed information because I just don't have it at the top of my head.

[The information follows:]

LONG TERM ENERGY RESEARCH

The Department of Energy performs research and development in three categories: Atomic Energy Defense includes weapons, materials support, naval reactors, nonproliferation, threat assessment, and environmental management R&D; General Science and Research funds the high energy and nuclear physics programs; Energy Programs consists of all energy related research such as nuclear fusion and fission, basic energy sciences, biological and environmental research, energy efficiency and renewable energy, and fossil energy. The total departmental budget for research and development, exclusive of capital equipment and construction projects, is $5.8 billion and $6.1 billion in FY 1995 and FY 1996, respectively. The FY 1995 total includes $2.7 billion for energy programs, and FY 1996 includes $2.9 billion for energy programs. The following table provides detail on energy programs research and development.

LONG-TERM U.S. ENERGY NEEDS

The Department relies on the Energy Information Administration (EIA) to obtain information on future U.S. energy needs. EIA maintains the National Energy Modeling System (NEMS), a comprehensive model of U.S. energy supply, demand, and prices, which provides projections of energy markets through 2010. EIA's projections are published annually in its Annual Energy Outlook (AEO), the most recent issue of which was released in January 1995. Included in the AEO are projections of energy demand, which, subject to EIA's assumptions and methodology , provide an indication of energy needs for the U.S. through the forecast horizon. EIA currently plans to extend the time horizon of NEMS, and intends to publish forecasts through 2015 in its next AEO. There are no current activities within EIA that indicate U.S. energy needs beyond the year 2015.

DEPARTMENT OF ENERGY
Research and Development Activities
(Operating Expenses Only)
(DOLLARS IN MILLIONS)

	FY 1994	FY 1995	FY 1996
I. Atomic Energy Defense Activities	2,468.7	2,329.1	2,465.0
II. General Science and Research	675.1	700.1	708.0
III. Energy Programs			
Office of Energy Research			
Basic Energy Sciences	589.2	614.6	720.1
Biological & Environmental Research	319.8	333.9	333.0
Fusion Energy	302.3	346.5	289.9
Advanced Neutron Source	16.2	19.8	0.0
Multiprogram Energy Lab Support	1.7	7.1	9.3
Technology Transfer	37.4	56.9	58.8
Energy Research Analyses	3.7	3.4	3.5
Small Business Innovation Research	54.0	0.0	0.0
Assistant Secretary for Conservation and Renewable Energy			
Conservation R&D	338.2	389.7	489.8
Hydropower	0.9	4.8	0.9
Solar Energy	188.5	235.6	256.2
Energy Storage Systems	16.2	14.9	13.1
Geothermal	21.2	35.9	36.1
Electric Energy Systems	35.3	37.7	40.8
Assistant Secretary for Fossil Energy			
Fossil Energy R&D (coal/petro/gas/coop)	332.5	345.4	342.6
Clean Coal Technology	221.5	37.1	27.0
Office of Nuclear Energy			
Nuclear Energy R&D	208.8	172.1	228.8
Uranium Programs	2.7	2.5	6.2
Office of Science Education and Technical Information			
University and Science Education	55.2	57.5	53.1
Assistant Secretary for Environment, Safety and Health			
Environment Safety and Health	21.8	21.8	21.8
Office of the Deputy Under Secretary for Technology Partnerships and Economic Competitiveness			
Technology Partnerships	0.0	0.0	1.0
Office of Civilian Radioactive Waste Management			
Civilian Waste R&D	6.6	0.6	0.0
Total Energy Programs	2,773.7	2,737.8	2,932.0
Total Department of Energy	5,917.5	5,767.0	6,105.0

TOKAMAK PHYSICS EXPERIMENT

Mr. FRELINGHUYSEN. It is my understanding that the Tokamak Physics Experiment is on the critical path to commercial fusion power and TPX is also unique in the world fusion program. Can you describe the scientific role that this new device will play in international efforts to harness fusion energy and what role will TPX play in the U.S. fusion program?

Dr. KREBS. Well, ITER is a critical next step in moving forward with the commercial demonstration project, and the international participation in ITER has been built in to this project from the very beginning. I think it has been extraordinarily successful in building bridges and developing frameworks for international cooperation that will benefit us not only in fusion, but in other international projects as well.

The TPX is a crucial element, in my opinion, in sustaining our domestic Tokamak program and providing for an environment that will advance the physics. And although it will certainly influence the experimental program at ITER, the real impact will be on an improved commercial plant or a demonstration plant. It also has the advantages of maintaining an independent capability for our industry to participate in the commercial demonstration plant, if and when we move forward on that.

Mr. FRELINGHUYSEN. In the Department's fiscal year 1996 budget request, on page 72, it says, and I quote, "TPX will be the first new major U.S. fusion research facility built since the present generation of Tokamaks were designed in the mid-1970s."

Have the Japanese and European Community made greater investments in their fusion facilities?

Dr. KREBS. In this time period, I believe that is the case. Certainly the Europeans have upgraded the joint European Torus which is in England. We are aware of plans for the European Community to build substantial large scale stellarator facilities. I have understood that the Japanese are moving forward similarly with a big facility. I would like to provide you with more explicit detail for the record.

[The information follows:]

JAPANESE AND EUROPEAN INVESTMENTS IN FUSION

The relative investments made in fusion worldwide have changed in recent years. In 1978, the U.S. effort, as measured by the number of person-years, was about twice as great as each of the other major programs. Between 1980 and 1984, all four major programs were about the same size. But, beginning in 1985, the efforts of the United States, Japan and the Soviet Union all began to shrink relative to that in Europe. By 1988 the European fusion program was about twice the size of each of the other major programs.

We have information that describes the level of activity in fusion energy research and development in the U.S., European Union, Japan and Russia. Because each of our systems is different, there is no simple analysis that conveys a true comparison. To answer the question, we have taken the available information and made assumptions to develop an approximate comparison of effort. For the European Union, which budgets for the entire fusion effort through its Commission and the Member States, we have used the recent currency exchange rate to arrive at a dollar figure. For Japan, which budgets separately for technical personnel and other fusion activities, we have taken the currency exchange rate applicable to last year and also assigned the average U.S. cost for the personnel involved. For Russia, we have judged that the scale of the program in recent years was comparable in effort to the U.S. and used the current information from Russia that science, generally, and fusion in particular, is receiving about half the planned level.

With these assumptions, the relative dollar figures are the following for Calendar Year 1994 which is an average of the most recent numbers available:

United States	$322M
European Community	$580M using 1ECU=$1.29
Japan	$460M using 100Y=$1
Russian Federation	$161M using 1/2 U.S. program

Mr. FRELINGHUYSEN. I understand—then Mr. Fazio has some questions.

I understand that the Japanese and Europeans invest about 40 percent more than the United States in fusion energy research. Do you think that is accurate and how vigorous is the United States domestic fusion program relative to our international economic competitors?

Dr. KREBS. Dealing with the first question, my understanding is that the European Community jointly spends close to 50% more than we invest, and my understanding is that the Japanese investment is on the same order as the U.S. investment.

With respect to the vitality of the domestic U.S. program, obviously we are full partners in ITER at this moment. We share jointly and provide strong leadership and are sought out by our partners in the fusion program. I think the real challenge is to maintain that vitality. I think we measure up now, and in fact obviously the TFTR is not matched in any other part of the world, and so the challenge is to maintain it.

Mr. FRELINGHUYSEN. Thank you very much for your responses. Mr. Fazio.

SCIENCE EDUCATION

Mr. FAZIO. Thank you, Mr. Chairman.

I want to welcome you back, Martha, and say that I am glad to meet the other two people at the table and look forward to working with them. I have some questions for everybody.

I thought I would start with Mrs. Rumsey and ask about the fact that the Department's budget that I gather you directly oversee has $55 million for university and science education, but apparently in the Department-wide, there is $160 million in additional funds which are dedicated to educational activities.

I wondered how that all is coordinated, what your role may be in that regard, are we getting the real return on that kind of investment, which seems to be to some degree diffused?

Ms. RUMSEY. Absolutely. The short answer is absolutely. You are right, our office portion of that is $55 million, and I would characterize our relationship with the other program offices as providing leadership and guidance. We have dedicated the last almost two years to developing tools and management techniques that will result in a better managed science education program, and we have applied those tools to our own portfolio of programs.

We have also rolled those out and shared them with our colleagues across the Department because they, too, are interested in investing in high quality science education programs. And as I mentioned, in the past, in the instances where the program offices are investing in science education activities, those activities tightly align with their individual program missions, and in fact represent the way that in a lot of instances that they accomplish those missions.

Mr. FAZIO. Apparently in the 1992 Energy Policy Act, we asked the Department to develop a method of evaluating the effectiveness of its science and math programs that are managed both by the Department and the laboratories.

I wondered if you could indicate what you have done in compliance with that and what you may have learned if you have applied those standards so that we could have perhaps made some evaluations of what we have been doing in not only your area but Department-wide.

Ms. RUMSEY. Absolutely. First of all, we have developed what we call an automated decision tool that we use as a filter to evaluate proposals that come into the Department for funding. And what this automated decision tool does is to ensure that the proposals that are coming in are aligned with our strategic goals and objectives, the national education standards, et cetera, so that is the first pass.

Then we have developed a series of what we call success templates that identify best-in-practice components, successful elements and programs that have been proven, and we apply that template to those proposals that have successfully made it through the filter.

And then finally we have a very aggressive peer review process that helps us stack, rank those proposals that are coming in, and we make funding decisions based on that process.

For those proposals that, as an example, or those past activities that we inherited as a part of our portfolio, when applied, when we have applied the automated decision tool or the success templates and we have found that they are not in alignment, we have made decisions to terminate funding or, in one case, we found that one activity that was in our portfolio had little to do with science education, and so we transferred it out into a program office where it made sense to be better managed.

Mr. FAZIO. Thank you.

Dr. MacLachlan, obviously you have had a long background in the private sector. I just read your statement, even though I had to leave before you finished reading it to us, and I wanted to ask you, just sort of throw you the ball, to tell us where you think in your experience our laboratories are in the Department of Energy programs. Maybe government in general programs miss the bet with the private sector, where we could do a better job, perhaps, of connecting with the real practical application of the kind of basic research that we do.

Dr. MACLACHLAN. I don't really think that you are missing the bet. I think that obviously Congress in a series of steps from about 1980 has worked to try to get this concept of technology transfer correct, and that is probably not a good term, technology transfer.

Mr. FAZIO. We sure use it a lot.

Dr. MACLACHLAN. I know we do. I do, too.

Mr. FAZIO. Give me a better one.

Dr. MACLACHLAN. It doesn't really describe the process. There is no question there is technology transfer. That always gives you the impression that something is going from here to there, and in most people's minds from government to industry, and I don't think that is really the case.

Technology is basically transferred by codevelopment, by working together, by each party bringing their piece to it and then when the time comes, they part. That is sort of the way I look at the ideal relationship between especially larger companies and industry sectors working with the government labs because that is where I see the biggest savings.

That is, working in the areas where there is technology that is still not quite certain of what it can really apply to, but it is the kind of technology the labs need for their missions, or they think they do, and industry similarly thinking, by working together, as I indicated, you clearly save money, but that is really a small part of it. It is speeding the whole process up.

Incidentally, that is part of what has changed in the world with respect to industry. I kind of cited, there seems to be more technology around to look at these days than there ever was. I am not sure that is the case, but it seems to be. One thing I guarantee—I mean, I know for sure is that the time you have got to look at it before somebody else has beaten you to the marketplace is shorter and shorter, so that was another reason why I saw the partnerships with the labs as being such an ideal thing. And certainly the lab missions are similar, they don't perhaps have that to-the-marketplace urgency, but on the other hand, if you are in a defense situation, you may well have that.

Mr. FAZIO. But are we getting a little bit more of a marketplace urgency in the labs? I know in the sense that they are a little less sure of their future, a little less confident of their place in the spectrum. Are we seeing them develop a little more alacrity and interest in moving more quickly in the time frames that you have indicated?

Dr. MACLACHLAN. I think for all the reasons, and I think they are good reasons, that we just talked about the various statutes and directives and so forth since 1980, and it was kind of interesting in the Galvin report that there were comments about this competitiveness initiative and how it would better focus on the mission and anything that we do in competitiveness is a derivative of that, but it did not complain about sort of the industrial savvy of the people in the labs.

Earlier reports that have been written about the labs in the past have said, you know, they are just so far out of touch with reality. That is very much the way we incidentally viewed our corporate labs back 10 or 15 years. I think great things have been done.

Mr. FAZIO. Are CRADAs working from your standpoint?

Dr. MACLACHLAN. Yes, they are. I think one of the great—that is one of the great ideas that has been put forward. I think the reason it works is because it is a genuine partnership working together which I believe is fundamentally the way really most valuable technology is developed and transferred, and transfer to me is both ways.

Mr. FAZIO. Sixty percent of the funding is private sector?

Dr. MACLACHLAN. At the present time, yes.

Mr. FAZIO. Is there a point where that begins to break up the link? How much more, frankly, can we leverage out of the private sector given our budget problems?

Dr. MACLACHLAN. That is a very interesting question, and I have thought about that myself and been dissuaded by various people from my thoughts in this area. But fundamentally the way I start is if it really is in the areas that I just talked about, and that is in the longer range, more, you know, we are not really sure what is there type of thing, it is very hard to assign a value to what industry puts in and to what we put in.

Generally, when you work that way, you say, well, heck, let's go 50/50, but as you begin to move forward and the values become apparent, then I think each partnership if we have a continuation needs to be looked at relative to the values that each partner is extracting from it. If industry is going to get most of it, they ought to pay most of it.

Mr. FAZIO. Every one is negotiated separately?

Dr. MACLACHLAN. Yes.

Mr. FAZIO. There is no formula?

Dr. MACLACHLAN. No, not really. In the case of small businesses, and the smaller amounts, it is a much less restrictive thing. Definitely when it is anything of any size or potential great value maybe involved here, whether it is with a sector or with an individual company, it is done quite carefully to make sure we don't get a distortion if success occurs.

Mr. FAZIO. Mr. Chairman, I have two questions for Martha. Do you want me to wait for another round?

Mr. MYERS [presiding]. No, proceed.

INERTIAL FUSION ENERGY

Mr. FAZIO. Okay, I wanted to ask first of all about the budget proposal. It has funds for a new construction start for a small inertial fusion facility. At the same time that that kind of initiative is included, there is sort of a general reduction in the base funding for the inertial fusion research program.

I am just wondering, I am just going to ask you, can you explain what may on the surface seem to be an inconsistency, and ask you what we can do given the support that OTA seems to be providing for this program, can we keep it alive? Can we keep it going?

Dr. KREBS. Well, we certainly propose to maintain it at least and to keep it going in the 1996 budget proposal, so obviously I think——

Mr. FAZIO. You have got to make room for somewhere else, then?

Dr. KREBS. There is a commitment to, you know, move forward with that proposal and to take advantage of the capability at Lawrence Berkeley Lab and to build on the cooperation between Berkeley and Livermore, so I think the commitment to the program is there. Obviously there were difficult decisions that had to be made as we formulated the budget in the internal processes in the program.

Mr. FAZIO. But you would hope the Congress would basically sustain the judgments that you have made rather than spread the money around as we so often do and make incremental?

Dr. KREBS. I would certainly appreciate that, yes.

DOUBLET-III UPGRADE

Mr. FAZIO. Thank you. Let me ask about something at the other end of the state, the D–III–D facility in San Diego. It has really become a center for excellence for fusion research. There are five UC campuses and some outside the State participating there at that facility.

Dr. KREBS. The national laboratories, too.

Mr. FAZIO. Several national labs as well collaborating and the ITER engineering facility is nearby. I am just wondering what the Department's intentions are with regard to sustaining this program. It seems to have played a pretty key role in certainly some areas of fusion research and certainly in that part of the country.

Dr. KREBS. Well, it is my sense from what I am hearing from investigators or from the scientists in the Fusion Program, that D–III–D is viewed as one of the most versatile Tokamak facilities that we currently have, and in particular, it plays an important role in supporting the ITER research and design activities, and as a consequence, the program has worked hard to sustain the activities of the D–III–D.

INTERNATIONAL THERMONUCLEAR EXPERIMENTAL REACTOR

Mr. FAZIO. Just to wrap up on ITER, what is the current level of commitment from the international community? I know we are proceeding, but what happens if we don't get the kind of follow-through from the international community because, you know, we have been through this sort of thing before with the SSC and there is a certain hypersensitivity here to the question of whether or not these kinds of commitments are made and then kept by our friends as well as by us.

Dr. KREBS. Right. You know, unlike some of the other programs in which we sought international cooperation, this is a project which, from the very beginning, has had international cooperation built in. The commitment of the Japanese and the European Community has been exceedingly strong and they have honored their obligations.

You may have heard that the Russians are having some difficulties, but that is not because of lack of interest. It is primarily because of the economic uncertainties and difficulties that they are having throughout their economy. All of the partners have been and are committed to working together and maintaining their commitments and at least participation.

Mr. FAZIO. When would you expect that we would be deciding whether to begin construction?

Dr. KREBS. Well, the engineering design activities are scheduled to be completed in mid-1998. If we are to maintain the schedule that was originally anticipated, and we would need to make a decision on siting, and thus construction sometime prior to 1998. We are in discussions within the ITER Management Council about how we will arrive at that decision. The PCAST, the President's Council of Advisers on Science and Technology, Review is an important element in raising the discussion about construction to a presidential level.

Mr. FAZIO. Thank you very much.

Thank you, Mr. Chairman.

Mr. MYERS. Thank you, Vic.

I am going to leave most of the fusion questions for you, Rod.

Mr. FRELINGHUYSEN. Thanks.

Mr. MYERS. If you don't hit all of them, I will probably ask a few more questions. I am not going to forget you, Martha.

One of the things that has concerned this committee and I guess more particularly me through the years, when we see one office broken up into smaller units, it seems like it always costs us a lot more but we really don't see much benefit from it two or three years down the road.

One of the concerns I have had for a long time that we still are in the United States I think on the leading edge of technology, research and development, but somehow it never seems to transfer down for industry where they can use it. This has concerned me.

Now, we have created a new office here, Dr. MacLachlan. What can we expect next year and two years from now?

TECHNOLOGY TRANSFER

Dr. MacLachlan. Well, I think the goals that I am seeing for myself right now are to carry on with some of the very important initiatives that were well underway, and that is to speed up the process by which we can form agreements and form partnerships with industry. That to me has reached the stage where we can pretty much see where it is going to go.

I think the goal that I am really most focused on is to make sure that we have throughout the whole system in the hands of all those people who form partnerships a clear idea of what is a good quality partnership and how to manage it and evaluate it and make sure it is really delivering on what we expect out of it.

I think in the Galvin report, there was concern that some of these partnerships looked like they weren't quite in the central mission area, and I think, I view that as quite possible. In fact, I have done a little traveling around myself and I am going to be doing some more next week to dig into these things further. But actually I really only have a feeling——

Mr. Myers. Is that why your wife came in, so she could see you once in a while?

Dr. MacLachlan. You have got it, Mr. Chairman. She is heading off for Delaware tonight.

Mr. Myers. I am married, too. My wife is, anyway.

Dr. MacLachlan. Well, anyway. So I really feel that my contribution to this effort can be to pick up where others have brought it to, and now refine some of those things, and I think this whole area of making sure these partnerships are really delivering what we want and also that we continue to work on the culture.

I come from industry, and, you know, we talked a lot about and people have talked a lot about having to change the culture of the labs. Well, the last five years I was at DuPont, and many of my colleagues, incidentally, in the Industrial Research Institute, who are CTOs of many major companies and had the same experience, getting your people to think differently from the way we used to do in the past. That is, essentially control everything with research and instead start looking outside and form partnerships so that we can start getting more and more efficient. In effect, to free up resources either to keep improving the company or forming new businesses or whatever, something that is much more difficult to do today than it is is part of this whole responsibility.

GALVIN REPORT

Mr. Myers. Well, you have referred several times to the Galvin report, and we have read it a number of times, and I used the term it was critical. I was corrected yesterday. It wasn't critical, it was just suggestions, but whatever it is, there was a concern about change. I am not quite sure that I understand what he was saying there. We had Mr. Galvin in, when he talks about the Department of Energy should be the customer of the labs.

How would you explain that relationship maybe so I could understand it?

Dr. MacLachlan. Well, I guess, and here I am new in this political environment, but I guess——

Mr. Myers. Maybe I am, too, I don't understand it.

Dr. MacLachlan. I guess I interpret it as saying that the Department of Energy is fundamentally the vehicle of Congress to see that these missions are carried out, whether they are defense, environmental, or science missions. And in large part the laboratories are where those things are done, not wholly. The universities, obviously, are a component of that as well, and so in that sense, the laboratories really ought to view themselves as the suppliers to the business heads, if you will, in the Department of Energy who are carrying out the mandates of Congress. I think that is what Mr. Galvin was interested in.

I think his criticism of the relationship is all of these overlays, these various organizations that seem to be involved in the pathway of this customer-supplier relationship, and Secretary O'Leary, as I am sure she has informed you quite vigorously here recently, is determined to get at this through various techniques.

One of them is responding to virtually a high percentage of the recommendations of the Galvin report, and other activities within the Department of Energy in the way of getting at some of the organizational problems we have and making that connection more like a real customer-supplier relationship. And in that sense, I think that we are very supportive of what Mr. Galvin and this committee have given us.

Mr. Myers. Well, now you came from the private sector. DuPont is certainly one of the best known companies in the country. In some places, it is practically a country, isn't it? In Delaware it is, isn't it?

But coming from the private sector, what have the labs got to sell?

Dr. MacLachlan. Well, I think I have tried to say it over and over again.

Mr. Myers. I presume you have been visiting the labs?

Dr. MacLachlan. Yes, I have. Of course, I had familiarity with the labs anyway because, as I mentioned, essentially the whole time I was senior vice president and chief technical officer, I was driving, seeking different ways from the way we were used to getting the majority of our technology in the past. And I will tell you for most of that eight years I was driving, trying to figure out how to work with the government because the technology capability in these labs are just really enormous, and the quality of the people and so forth are enormous, and they are right in the areas that virtually every technology-driven company needs. They are in the areas of the ability to use computers in very important and large-scale ways, they are in new materials, they are even now today in some important aspects of biotechnology, which are particularly important to many industries.

So we saw the labs—and of course all kinds of new measuring techniques and so forth—we saw the labs as terrific groups to partner with. I have to tell you early on, we found our concerns were justified in working with the government that it would be difficult and hard and it would be hard to negotiate agreements. But that has changed significantly, although there is still a way to go, and that is part of my objectives in this current job.

Mr. MYERS. I am going to yield to Mr. Frelinghuysen. I didn't realize when I accepted this gavel there is more responsibility than just knowing how to hammer on it. Hammering may be part of it, it may be associated with it in any event, but if you can do it in 10 minutes, then I will just recess, I apologize for these interruptions. I have a few more questions. Go ahead.

INTERNATIONAL THERMONUCLEAR EXPERIMENTAL REACTOR

Mr. FRELINGHUYSEN. Thank you. I want to get back to fusion again. Mr. Fazio raised some questions about ITER. I wasn't quite clear from your responses to Mr. Fazio exactly what other countries contribute to that project.

Dr. KREBS. This is a——

Mr. FRELINGHUYSEN. And how much, quite honestly, has been invested to date.

Dr. KREBS. I am going to have a hard time giving you exactly the numbers of the cumulative investment, but in the 1996 budget we are proposing to invest around $80 million, and the intent is that it be matched evenly by our partners. So it is a one fourth, one fourth, one fourth, one fourth type investment.

Mr. FRELINGHUYSEN. Our contribution actually has increased, hasn't it?

Dr. KREBS. That is right. It was $70 million in 1995.

Mr. FRELINGHUYSEN. Why hasn't it actually gone up?

Dr. KREBS. I think it was anticipated that it would, but we don't anticipate it increasing that much more between now and 1998 when we finish the engineering design activities.

[The information follows]:

INTERNATIONAL THERMONUCLEAR EXPERIMENTAL REACTOR

Each of the four Parties in the ITER joint undertaking has agreed to contribute an equal amount of resources to the common effort. This equality was agreed upon at the start of the preceding Conceptual Design Activities, begun in 1988 and completed at the end of 1990, and it continues through the current Engineering Design Activities. For the three year Conceptual Design Activities, each Party provided the same level of resources which were equivalent to a U.S. cost of about $50M. For the Engineering Design Activities, each Party has agreed that over the six year period it will provide the same level of resources which included a one-quarter share of the coordinated R&D estimated at $750M in 1989 U.S. dollars and a one-quarter share of number of design personnel whose average total cost, worldwide, was estimated to be about $250M in 1989 dollars. The European Union, Japan and the United States are providing these planned R&D and personnel efforts while the Russian Federation is now encountering significant difficulties because of the overall financial situation there.

In addition to these contributions to the common effort, each of the three Parties which hosts a Joint Work Site (European Union in Garching, Germany; Japan in Naka, Ibaraki Prefecture; and United States in San Diego, California) bears a host support cost and each of the four Parties also bears a cost for management of its Home Team.

The total investment through FY 1995, in as-spent dollars, for the U.S. in both Activities noted above is about $250M. This is equivalent to similar investments by the European Union and Japan; the Russian investment is somewhat lower.

Mr. FRELINGHUYSEN. Given the current climate in Congress and the administration's efforts to downsize the Department of Energy, is it your belief that ITER will be constructed? I am putting you right on the spot.

Mr. FAZIO. Give us the odds.

Dr. KREBS. I think that it is very difficult for me to say. I don't think that it is something that I can say by myself. I think that the PCAST review is going to be extremely critical to the administration's perspective on this machine, and so I don't think it is appropriate for me at this time to guess or to state a belief until that review moves forward.

FUSION BUDGET

Mr. FRELINGHUYSEN. Can we continue—and this certainly relates to the international effort, but most particularly these questions relate to domestic, can we continue with a strong domestic fusion program with a flat budget for a number of years, and can we build a new Tokamak if we continue the fusion program at its current level which I believe is $360 million?

Dr. KREBS. I think it would be very difficult to do that.

Mr. FRELINGHUYSEN. As you are aware, currently Chairman Rohrabacher is preparing a fusion reauthorization bill in his committee, and I have heard talk that he is recommending funding the fusion program at somewhere in the neighborhood of $200 million annually.

Could you tell the subcommittee what a $200 million a year fusion program would look like and what the consequences would be?

Dr. KREBS. I can tell you the kind of pain for the record that might be involved in a $200 million program in the most general way, but I think it would be very hard to tell you what in steady state a $200 million program would look like. First, we would have to work with the community and, second, I think we would go through a period of incredible trauma in the fusion community.

We would lose people that would not be replaced for probably a decade at least, and that loss is in both the people who are engaged now and the attractiveness of the field for young people, and so I think it would be difficult to describe what a steady state fusion science program at $200 million would look like. I won't promise that.

[The information follows:]

REDUCED FUSION PROGRAM

I don't know exactly what a $200 million dollar per year program would look like. However, I can say that there would be incredible trauma. We would lose people that could not be replaced for a decade and we would not be able to attract young people to the program. We would have to work with the fusion community to redesign the entire program.

APPLICATIONS OF FUSION POWER

Mr. FRELINGHUYSEN. I should hope that would not happen. It is certainly said this is a pretty big target, this area, and I think it is important that our citizens and the Congress know how important this part of our energy program is, and certainly I think a lot of what we do here helps to educate the public.

I think the public really needs to know and have a greater confidence and understanding in what you are doing and in fact the applications for what we put this research toward, something which to them is visible and understandable. I am not sure that case has been made adequately. I am not sure why.

Would you like to comment on that, just in terms of the applications of how these technologies are applied to other things? I know you have your charts over there and I assume that in many cases those relate to these types of applications.

Dr. KREBS. They do, but some of them are not explicitly fusion related. You may have, in fact, I know that I have here.

Mr. FRELINGHUYSEN. I have that book, but I am saying that—I have that book, but what does the rest of America have?

Dr. KREBS. I think the program has been making serious efforts to get the word out about what the impacts of the program have been while we have been pursuing the ultimate goal of fusion as an energy source for this country, and clearly you know what the various examples that are contained here. It is a challenge. I think it is a great challenge to the program.

You know, the different parts of the program, the different institutions, whether it is Princeton or General Atomics, work in their local communities with students and with teachers to get the message to their local communities. The vehicles for getting the message generally out about what the Department and its science and technology programs, its laboratories are doing is a major challenge. I think—you are giving me an opening here.

Mr. FRELINGHUYSEN. I am excited by what you do, and we certainly know what the impact is when any program is terminated or in some way curtailed in terms of the local economy. My attitude has always been that of the mission. It is in our national interests a lot of what you are doing, and while the local economy may be one thing and certainly every State is proud of whatever they have in the way of facilities within their borders, there is a greater national mission here.

I do think that you sell that mission by making the applications understandable to the average citizen. I think more needs to be done in that area. I am sure I am not alone in that feeling.

Dr. KREBS. I agree.

Mr. FRELINGHUYSEN. Mr. Fazio, do you have any other questions or maybe we should take a recess?

Mr. FAZIO. I think so.

Mr. FRELINGHUYSEN. Take another recess until the Chair comes back. Thank you for your being here, and we will get back to you.

[Recess.]

TECHNOLOGY PARTNERSHIP

Mr. MYERS. The committee will come to order, resume having fun and games here.

We apologize for having to go over and vote so often, and it is not over yet, I guess. Dr. MacLachlan, you say you don't like to call it technology transfer, but whatever you call it, the knowledge we are learning in the labs or scientifically, whatever source, and getting it out where we can use it to be competitive in the world, I guess that is what we are all talking about. If there is a better way, we are all searching for it. It hasn't worked to my satisfaction anyway. You are telling me that maybe I am misjudging this.

Continue, if you will, please.

Dr. MACLACHLAN. Yes. Well, I think it is beginning to work is the way I look at it. The reason I said what I did about tech transfer is, to me, coming from where I come from, it implies somebody is going to just toss something at me and it is going to be immediately usable and we are ready to go.

Tech transfer—technology doesn't work that way. There are a few examples where something is sitting there and it was held away from the public, let's say, for one reason or another in the national labs, and then it was made available when success can be made from it, or licenses could be obtained. There is some of that, but the real way you transfer technology is to work together with the people who understand it and develop it further together. Then, depending on what your ultimate mission needs are, if you are in industry, that is products and processes and new businesses, if you are in the government, it is some support of some mission, whether it is environmental, defense, or energy. That is really what I am trying to say.

So to me the natural place for industry to partner with government, and this is the predominant place, not all of it, is in this early development of looking at technology and advancing it so we get further understanding.

A lot of people define research. Research doesn't make a product, it produces knowledge. Whether it is knowledge to support a process we are running today and we have had around for 35 years and run it a little bit better or whether it is knowledge to provide the basis for an entirely new chance to get at a new market, that is really what research is.

So research of the type I am talking about and the kind that makes most sense to partner is where you are working together to advance the knowledge. The more different minds and different cultures that you have looking at it who, of course, have the basic capabilities in the sciences, the more likely you are to get some very unusual and new things. That is why I like the whole idea of partnering. It is not just whether I like it or not, we have to do it.

I mean, the costs of actually looking at the vast array of new technologies to see whether or not they can give us an advance, again, as I say, whether we are in the government or industry, it is just getting a lot higher and higher. And the time you have to do it is shorter and shorter, and the competition that we have today, say, versus 25 years ago is not ourselves here in the United States, it is all over the world. That is good, but it means you have got to change the way you do things, and so there has been—there is a real structural change occurring.

I was in DuPont for 35 years, and I must say, I always thought I worked hard, but I will tell you the last 10 years as we tried to adjust to all these changes was really quite frenetic. And I am sure that it is not going to slow down and I don't envy my successor.

Mr. MYERS. You mean, you are not going to get overtime tonight?

Dr. MACLACHLAN. You don't pay overtime. We didn't get it in industry, either, at least where I worked.

Mr. MYERS. When you are on salary, you don't.

This has always been a concern to me. You mentioned about things hanging around the lab and never got out to where it needed to be. Who would ever guess that that unknown quark we heard about for so many years was in Chicago all the time? We would have saved a lot of money if we had known that.

Dr. MACLACHLAN. You better explain that one.

Mr. MYERS. What are you laughing about? That is where they found it, wasn't it? I don't know whether they found it or they caught it.

Dr. MACLACHLAN. They made it and they caught it and it ducked out.

Mr. MYERS. Can they find it again?

Dr. MACLACHLAN. Ask Martha.

Dr. KREBS. Oh, yes.

TECHNOLOGY PARTNERSHIPS

Mr. MYERS. Well, I think something has to be done to improve our technology transfer. I again will go back to that word that no one likes. We still are the leading edge of the world in research, but it seems like other nations are picking up where we go up to a point, then they run away with it.

Dr. MACLACHLAN. It may seem that way. I still believe that we are the best in the world, and the reason is we have these wonderful assets. We have got a great industrial complex that had many, many years of almost uncontested success after World War II, although that changed really starting in the 1960s, as we all know.

We have got this great university system. There is no other country in the world or no other combination of countries in the world that have a research university system of the caliber of ours. Of course we have the great national labs that got to where they are because they were facing, year after year, incredibly challenging tasks, and that is what has given us all this capability.

And I guess my interest is that the idea that Congress really has had and been pushing since the 1980s is a great idea. It is 15 years now since the Stevenson-Wydler Act. You might say that is a long time. Well, I will tell you, it is a long time, but it is not a long time to change cultures and for other events in the world to bring the partners to the table. Industry, up until fairly recently, as we all know, really thought that it could continue the old ways and that the world really was going to go back to the way it was.

We have now realized that that is not the case. We have to strive for new ways to work together, and the asset base that this country has in these three basic institutions is not matched anywhere. I combine that with the other what I consider major asset of this country, and that is the entrepreneurial spirit that we have, the small companies, the individuals who really can do things, and of course the large companies who can do different things. This is one heck of a combination of assets, and really what I like being involved with is the chance to work this asset base and actually to pick up on it now after so much good work has already been done. It is kind of a good place to be.

I had a business like that at DuPont one time that I got into when it was just starting to make money, and it did very well, and everybody said what a great guy I was, but I really knew that it was the people before me, and I think we are in a similar situation.

Mr. MYERS. Nothing is quite as successful as good luck, is it?

Dr. MACLACHLAN. That is right.

GALVIN REPORT

Mr. MYERS. I think we are all concerned about it. Of course the Galvin report comes along now. I think probably Mr. Galvin is wondering when they are going to quit banging away at him here, but he did suggest possibly that there might be a better way. That maybe the cost of the labs are fairly expensive. Forty percent. I thought his report said 40 percent were administrative costs. That is rather high in some of these areas. No industry, I don't think, could survive. Government can, but it is not an industry and it doesn't run very business like. There is evidence after evidence of that.

But nevertheless, maybe there is a better way. We have invited, have had invited this year some of the so-called think tanks and others to come in to give us a different opinion here. And several suggested maybe we really don't need the labs at all, that the private sector industry and universities are doing and can do the research cheaper and more effectively than the present system of labs.

Can you comment on that?

Dr. MACLACHLAN. Well, I think that one can always construct a system that will respond to the needs over time, but I look at what we have got as already constructed and perhaps there are parts of it that we can criticize and practices that have grown up over the years that seem to be kind of foolish in the light of today's standards and so forth, so that is really the way I view it.

I personally can tell you that in industry, and I am speaking both from my own experience and my colleagues that I know a lot of them, we will all tell you from industry that we have to look more to partnerships to gain advantage, to gain technological advantage. That is the key to really having successful businesses, and that is a very different change.

That is a very different paradigm from where we were even 10 years ago, and that the opportunity—and we are doing this, we are doing this with other companies, both large and small. We are doing it with universities and universities are changing and becoming more closely coupled to industry, but I think there is a limit to that.

What we have not done until fairly recently is to begin to view the national laboratories with their missions, and they do serve very special missions, and are very valuable assets as possibly a piece that can be worked into this process of technical excellence in the world. The United States has a special asset base here, and I guess I would be very loath to dismantle it.

I am not saying it shouldn't be changed in size as we look at the different magnitudes of the missions that face us today versus those that faced us a few years ago. I am no expert in that area. Martha and others are far more. But I believe these needs still exist. They may be in a different balance, and they all are based on the leading edge of a whole variety of technologies that really are very common to industry and the government mission needs.

That is what we have got to work together better with, and I like the idea of the continued patience that Congress has had in trying to promote this. I am sure there will be other things to do as we go forward, but I really do believe that it is beginning to take hold and, from an industry point of view, I think industry would tell you that as well.

RESEARCH EFFORTS

Mr. MYERS. Well, as you well know, maybe Congress has been patient but I am not sure how much longer, collectively, the House and the Senate are going to have the patience we have had in the past. You have already heard of privatization, doing away with the Department of Energy, handing it back to various other departments. I don't know whether that would save any money or be any more effective.

We created it because the job wasn't getting done. We wanted to be specific about the energy needs for our children and our grandchildren, and the security that we had to have, the national security out of the Department of Defense. There were a lot of reasons why it was created out of the old Atomic Energy Commission and ERDA, but we are concerned if there is a better way.

I think we in Congress are going to have to make a decision. Can we afford 25 labs and all the other university labs? Look at the major DOE user facilities and institutions there, look how many spots there are all over the country. Do we need three defense weapons labs when, my goodness, we are going out of business, it looks like, our defense goes down each year, our appropriations, so can we afford all of this?

I am going to get into fusion in a little bit, how much can we continue to afford in fusion. Education, everybody believes in it, but are we doing the right thing or are we fragmenting it too much? This is the thing that concerns me.

Lastly, did you retire or leave this last fall?

Dr. MACLACHLAN. Yes, I did at the end of 1993.

Mr. MYERS. Has there been any pattern as far as research? DuPont has always been one of the leading industry in research. Has there been any change in their research policies in that 35 years?

Dr. MACLACHLAN. Absolutely. They were basically continuous throughout the time I was there, but the last 10 years and certainly where I was in a position to really see and hear the decisions have been absolutely dramatic. We have seen ups and downs in business cycles, and I remember people saying, well, you know, this is a business cycle, it will go away.

I remember in the mid–1980s when we got our new Chairman, and he said he was going to do all kinds of things, and of course we had already seen many companies restructuring. But everybody said we have seen it before, but it is different, and research has felt it tremendously. DuPont is famous for having all these corporate research or a basic research lab which was kept separate from the business, essentially a tax on the businesses. Several times starting early in the early 1980s and then to the 1990s, there were attempts to say that we don't need this kind of a laboratory anymore because it seemed to be in isolation from the businesses and the cost pressures put more and more pressure on this.

Basically, I was in a position, in the last six years, of either agreeing that we should get rid of it completely because it was just working on too long a range stuff or try to couple it more tightly to the businesses. I chose the latter, and I am glad I did. I believe that other good companies have gone that way as well, but what that does is the opportunity to really explore new areas almost goes to zero.

In the 1960s, just to give you one example, DuPont had 65 new ventures, that is looking for entirely new business areas based on our core technologies to get into, and that was called the new venture era in DuPont. Today I am hard-pressed to enumerate more than two, and both of those are in serious trouble because they are just taking too long and costing too much.

Twenty years ago we would have been happy with them. That is the atmosphere change. It is a very short term atmosphere, and I might say that it is not a bad thing because one has to protect one's major good core global businesses, and there is a lot of technology needed to do that. A lot of this new technology that I have talked about is also, in fact, very vital to those businesses, not just to produce new opportunities, but the new opportunities has faded significantly.

TAX STRUCTURE

Mr. MYERS. Well, in talking to a great many different industries, it appears, and not having run a big company like you have, but it appears in our present tax structure it is almost impossible today to really venture very far out, which I think you are saying here, I think, on research or new development. Because of the tax structure, the government wants to take any wins you have but won't share the losses in effect.

It seems to me we are putting a burden on the lab, and the national—at least federally financed research, almost an essential necessity, especially in energy and sciences, the cost of research today is so tremendous. I don't know how industry, if we don't have something like this, will industry continue to do the research?

That is the reason I asked you about the pattern from DuPont. It seems like—I think probably you have done more research than a lot of companies have. Some companies have just literally stopped, haven't they, just can't afford it?

Dr. MACLACHLEN. That is correct, and they will look good for a few years, I predict, and then they will be in trouble.

Mr. MYERS. Then a CEO will say it didn't happen on my watch. I can understand. At our age—I guess I am probably older than you are, but I am here in this job, I can't do that. I know I am not going to stay forever here, I just think we have still got to come up with better answers, and collectively maybe we can. I am happy that you have chosen DOE, someone with industrial background experience.

SCIENCE EDUCATION

Now, Mrs. Rumsey, you thought I had gone to sleep on you, didn't you? You thought you had escaped? Martha knows she hasn't. She has been here before, you see.

As I recall in your budget request, you are requesting $55 million this next year, but you look at all the other functions of DOE, you have got education throughout. Why do we need a special office? I know, I remember your testimony, but——

Mrs. RUMSEY. To bring a corporate focus to ensure that as we look at what I refer to as a learning continuum from kindergarten all the way up to and through postgraduate. Typically the program offices are investing in high quality science, education initiatives and activities at the university and college level because this is the way that they are able to accomplish a lot of their missions, as I mentioned before.

But if you are going to have at the end of the effort a work force that is highly skilled and diverse and reflects what makes America great, the American mosaic, you have got to reach back into the learning continuum and excite youngsters about math and science. You are not going to get the total number of scientists and engineers and technicians that you need to perform these very complex jobs that are coming down the pike and going to be very prevalent in the information age, so what we need is a corporate view to ensure that there are no gaps along that learning continuum. And what we do is to augment what the program offices are doing to ensure that what you have at the end of the day is that highly skilled work force.

SCIENCE EDUCATION EFFORTS AT LABORATORIES

Mr. MYERS. You know, a few years ago we created a new department, the Department of Education. The argument for that was exactly what you are saying here today. Now, why do we need both? In fact, two years ago we talked about Goals 2000, all these things, the same argument again, math and sciences. Why do we need to have you, then, if we have got these other departments already doing that?

Mrs. RUMSEY. Certainly. What makes the Department of Energy unique, again, are the national energy laboratory systems and facilities, and under the collective roofs of the Department of Energy there exists this tremendous resource.

What the Department of Education brings is the best in how you train teachers or how you train students, pedagogy. In fact, what we recognize is, because of that uniqueness, we are able to partner with our colleagues in the Department of Education, in fact, there is an initiative that we have already launched that we expect to be in a position this time next year to report tremendous successes. What this compact does is targets or focuses on youngsters in urban and rural communities using technology to improve, make long-term improvements in their math and science education.

What we have to offer once more is the knowledge in science and math. What they have to offer is the pedagogy. And we have partnered to be able to demonstrate those results, so we find that by recognizing that which is unique through the Federal agencies and then setting up similar partnerships, we are better able to deliver on those commitments.

Mr. MYERS. I see your discipline was psychology.

Mrs. RUMSEY. That is right.

Mr. MYERS. Are you practicing this afternoon?

Mrs. RUMSEY. Every day, sir.

Mr. MYERS. Martha?

Dr. KREBS. Mr. Chairman, I would like to say something about this.

Mr. MYERS. I thought you had been awfully quiet.

Dr. KREBS. I know one shouldn't volunteer in these kinds of circumstances.

Mr. MYERS. Well, you are not in the witness box, so go ahead.

Dr. KREBS. You know, I was at a laboratory, I was responsible for the education programs at the Lawrence Berkeley Laboratory, and in this capacity that I have now, when I go to different laboratories, I have the opportunity to review their educational programs, and certainly at the Lawrence Berkeley Laboratory, we didn't try to take over the Education Department's job.

We basically, and in fact Mrs. Rumsey, Terry, mentioned BASTEC, the Bay Area Science and Technology Education Collaboration, which involved my former laboratory but also several other laboratories in the Bay area. And what I know is that that program is now working in conjunction with Department of Education and that what it brings to bear is a capability and a set of problems that really interest teachers and students.

I mean, you know, when you think about science and math as it is taught in the grade schools, they don't care about times tables, but they are interested when it can be used for understanding how water is affected in our environment, whether you have got clean water or not, and we work on those problems, we work on cleanup. People are interested in that. They are motivated by it.

Another example, I just have to show you this, I don't know who will take this up to you, can I get you to take it up, Ann? This is called a virtual frog.

Mr. MYERS. You are an accessory to the fact.

Dr. KREBS. We are entering this into evidence. Let me tell you, this is something that is now on the web. Students on the worldwide web, students and teachers, can dial in and they can do basically a bloodless dissection of the frog. It combines the efforts of people who did nuclear magnetic resonance research at the laboratory plus the computer scientists plus high school and science teachers to put that on the web, and you don't need to do dissections anymore. No place else can do this.

Mr. MYERS. Well, does the frog appreciate it or do the students?

Dr. KREBS. Probably both. It saves money, too. It saves money.

Mr. MYERS. More than 50 years ago I was dissecting a frog. I never got much out of it. I couldn't see much value. I wasn't planning to go into medicine or veterinary medicine effectively. I could never figure out why I dissected the frog, nobody made it very clear to me.

Are you a teacher also?

Mrs. RUMSEY. No, I am not, but I am a mother of a nine-year-old son.

Mr. MYERS. Does he dissect frogs?

Mrs. RUMSEY. I feel like I am back in school with him every evening. The point is, if he learns math and science the way I learned it, then chances are he won't choose a scientific discipline to pursue as his academic career.

But Martha makes a terrific point. We have got to meet young people at their point of need and their point of interest. We have had tremendous success in engaging students and teachers, along with the scientists that are doing the Department of Energy work; and, you know, I could give you examples of students who have said, "Wow, this is neat. What do I need to know to be able to do this?" And the answer is, well, some math and science, so all of a sudden it becomes relevant.

SCIENCE EDUCATION

Mr. MYERS. I am certainly not trying to downgrade education. I could use a lot more of it myself out of necessity, but I question the role, and I know you are very sincere, I am sure you are very effective in the job you are doing here, but can we afford this? It seems to me, like a duplication of effort, this is the only thing I am questioning here.

At the labs I have visited, universities are standing in line trying to get more time on the machine. Dr. Decker and I have visited a few of them through the years. They stand in line. I don't know whether they need any more motivation or not. We haven't got enough time or money to help them.

But anyway, that is one area that does concern me about duplication throughout. DOE is not the only agency. It is government-wide.

Mrs. RUMSEY. Well, there is just one thing I would like to mention. The reality is, and we are confronted with it every day, that we have less resources to accomplish the very important things that we need to.

Mr. MYERS. We have too.

Mrs. RUMSEY. Absolutely, and as a result and to illustrate that point, as an example, we have submitted a budget that represents 15 percent less than what we operated under last fiscal year.

Mr. MYERS. Thank you for that.

Mrs. RUMSEY. You bet. The fact is that there are some efficiencies that are being realized as a result of being better managed. We will continue those efforts, but I would like us not to walk away with the perception that the science education initiatives that the Department is undertaking are duplicative with other agencies' education initiatives.

What we do is we partner, we focus on what is unique, what we uniquely can bring to the table, and that way we will be able to realize the efficiencies that we must realize in order to accomplish our goals.

Mr. MYERS. Well, I don't mean to argue this. I looked around the room at the scientists we had here. You all got there and we didn't have this program to get you there. How did you make it? How did you ever get there without somebody motivating you. Saying why don't you get interested in a frog? I don't mean that to be facetious, but maybe I do.

Dr. KREBS. Would you like an answer?

Mr. MYERS. Yes.

Dr. KREBS. Not so much how I got here, but rather I think the point of some of this is new. The utilization of technology is not simply to produce people like me or the other scientists who are in the audience today or at the laboratories. It is really to produce people who are comfortable with technology, who are comfortable with and feel that they can ask questions about the world around them, and so when they go to work, whether it is in a lab or in a factory, they are imaginative about technology. That is what I think.

Mr. MYERS. I don't disagree with you. I hate to belabor this, but at some point, we in government have got to start thinking about what can we afford and what can we not afford and we have to start prioritizing. Everything is nice, we just can't continue to go in that route.

Dr. KREBS. I agree.

Mr. MYERS. I don't care how much motivation you are giving me, I never liked physics, I didn't like chemistry, I didn't like dissecting a frog, and I am not at all sure I ever did.

Dr. KREBS. Maybe if you could have done it on a computer it wouldn't have been such a bother.

Mr. MYERS. That didn't bother me. My brother was an embalmer, I used to help him all the time. What you are talking about here, that didn't bother me at all, but I just couldn't see any reason why that benefited my education.

I took one semester of Latin. I said, what am I doing in this class? I am a poor writer already.

I took one semester of typing. I learned how to type, but oh, no, the course said you had to take a full year of each. Why? This is the reason why I don't know whether you can teach that or not.

Oh, well, let's go on.

Mr. Frelinghuysen.

Mr. FRELINGHUYSEN. Do you want me to come to your defense or what?

Mr. MYERS. I think we are outnumbered, and they are between us and the door. Go ahead.

Mr. FRELINGHUYSEN. I don't have any questions.

FUSION ENERGY

Mr. MYERS. Dr. Krebs, I have a number of questions about fusion. Maybe if they have already been answered, please tell me about it.

We have supported fusion, as we all know this committee has for a long, long time. We have been blamed partly because we haven't adequately financed it. Maybe we are partly to blame. But we kept asking for that light at the end of the tunnel. You had the light. It didn't last long enough to help anybody.

I think that we, here again, it is one of those things we have got to make some decisions someplace down the line. Are we going to continue? Remember we went out to California and started out there. We have tried so many different things. This committee has been burned so many times.

Dr. KREBS. Well, I think we have heard you, and in particular—it is a process issue, obviously. I think that, as I said, we have asked the President's Council of Advisers on Science and Technology to look at the program, and I think that is going to be crucial.

Mr. MYERS. When?

Dr. KREBS. My understanding is that there is going to be some kind of an organizational meeting in the next few weeks of a PCAST subcommittee, and it is expected to report by the end of June or early July. That is my understanding.

Mr. MYERS. PCAST is going to have some report this year?

Dr. KREBS. That is my understanding.

Mr. MYERS. Jim says yes.

Dr. KREBS. He knows better than I.

Mr. MYERS. The second question I have, part of this system, of course, is the ITER. You mentioned that some decision is going to be made in 1998 on the ITER, and we have the TPX. How are they related?

Dr. KREBS. The ITER is intended to be a crucial next step for the commercial demonstration. The Energy Policy Act of 1992 set certain goals. ITER was a crucial step in moving towards demonstration in the year 2025 of commercial feasibility. I wasn't here, so I don't remember the law in great detail.

Mr. MYERS. I was here and I don't remember.

Dr. KREBS. The TPX is intended to provide a center for maintaining and advancing the science and the capability in the U.S. community and to provide for, in parallel, new information that will affect the commercial demonstration project, and also to involve U.S. industry so that we are ready to take advantage of the outcomes from ITER in the U.S., to be able to contribute to the commercial demonstration of fusion in this country. That is the intent.

FUSION ENERGY CHOICES

Mr. MYERS. Well, the administration and DOE decided not to advance the Advanced Neutron Source because it was just too costly. Can we afford both of these? Do we have to have both of them, the TPX as well as ITER? Can one be advanced without the other?

Dr. KREBS. You certainly can make choices to go with ITER alone, you could make choices to go with TPX alone. If we want to have fusion in this country by the middle of the next century, I think they go hand in hand with first achieving the technological demonstration and, second, having a human capability in this country to proceed or to take advantage of that.

Mr. MYERS. I guess I was wanting a yes or no. Can we build one without the other? Maybe we shouldn't, but will one be effective, can we build the ITER without the TPX?

Dr. KREBS. You can build ITER without TPX. You can build TPX without ITER.

Mr. MYERS. Would we be wiser to back off and continue to spend more money on research here on the TFTR, spend those dollars there? Back off ITER, back off both of them and finish this one, get this one so it is working?

Dr. KREBS. TFTR. All the current facilities are basically going to run out of something to do even if we were to keep them running in five to ten years, and then we have to face what do we really want to get out of this program. I am not ready, in the light of what we have asked PCAST to do, to give you a recommendation about what is best.

Mr. MYERS. Well, TFTR is going to run out anyway this next year. Don't we finish our research on it? We have to advance from there to something, but is ITER an advancement? It isn't? They are going two different tracks, aren't they?

Dr. KREBS. It is an advancement. It would move beyond what you can do at TFTR, there is no question that it is an advancement. TPX also would do something different and would provide more knowledge beyond what you can do at TFTR.

INTERNATIONAL THERMONUCLEAR EXPERIMENTAL REACTOR

Mr. MYERS. What will happen if the international partners on ITER back out? You are going to have an interim report this year and then make a definite decision by 1998. What if they collapse like on some of the things we have collapsed on like the SSC, would you build the ITER without international cooperation?

Dr. KREBS. I believe we entered into ITER as an international partnership because we did not believe that we could build ITER by ourselves. We saw the international participation and partnership as a way to stretch our dollars and to make the wisest use of the U.S. investment. I think that is why our partners are in it, too, because it is leverage for them as well.

Mr. MYERS. Well, one of the reasons SSC fell through, one of the many reasons, is because our international partners just didn't come up with the money.

Dr. KREBS. I think there is a major difference between the SSC and ITER, and that is that our partners have been in the business with us from the very beginning. They helped us; we have jointly designed this facility through the first early conceptual design. We are now intimately involved together in the engineering design activities program, and we have Americans and Europeans and Japanese and Russians out in San Diego doing research and working on design, we have Americans and Europeans and Japanese and Russians at the site in Japan and similarly at the site in Germany.

The site in Germany is directed by an American, the site in San Diego is directed by a European. This is truly an internationally integrated activity, the likes of which, certainly within the Department of Energy, we have not seen before.

Mr. MYERS. Well, Russia was a partner on fusion a few years ago but they are not today, are they?

Dr. KREBS. No, they are one of the four parties.

Mr. MYERS. Paying partner?

Dr. KREBS. They have been a full paying partner, and obviously they are running into trouble. There is a recognition on the part of the other partners that they have an intellectual capability and capacity to contribute, and we want to maintain them in this partnership.

Mr. MYERS. Well, back to SSC, we had lots of cooperation, enthusiasm in Congress here. It touched every State as long as it was a conceptual idea, but when Texas was selected they started falling off right and left. I wonder if the same thing may not happen when you select a site for ITER.

Everybody wants to go to the altar until they find out who is going to be the groom, and——

Dr. KREBS. I think that is a major challenge that we face in this program, and trying to decide how to do the siting is causing not only challenges in the United States. It is obvious that the Congress has pressed us on this issue, and I heard these concerns before last year, but it is also an issue for our partners.

Mr. MYERS. It is. Well, you know our position. This committee has always supported fusion, and we hope to continue, but we have got to do something. I don't know what the answer to it is. The Office of Technology Assessment, I am sure you have read this report, they may be out of business, too, but to kind of summarize here, without substantial funding increases the program will have to change significantly from the current direction and new goals will have to be set.

Who is going to set those goals?

Dr. KREBS. I think that if we are given direction by either the President or by the Congress that we have to change the funding path of this program, then I would recommend that we work with the fusion community to establish new goals and a new approach to fusion science and technology.

PRESIDENT'S COUNCIL ON SCIENCE AND TECHNOLOGY

Mr. MYERS. Well, isn't that what we are supposed to be doing here with PCAST?

Dr. KREBS. That is not fully the fusion community. I mean, that is going to be a broader view—that will have some fusion science experts involved, but there will also be general technologists.

Mr. MYERS. Haven't they been selected already?

Dr. KREBS. Not completely to my knowledge. We have got a Chairman, but, as I said, I think it is moving on a pretty fast track now. It took a little time to get started.

Mr. MYERS. If they can put a bunch of people together that are politically correct, and don't know what they are doing.

Dr. KREBS. I don't think it is politically correct.

Mr. MYERS. Who is going to make the appointments?

Dr. KREBS. The Office of Science and Technology Policy. It is the President's science advisor, and in conjunction with PCAST. Who is it? John Young, who is the former president and CEO of Hewlett-Packard, is the Chairman of PCAST. He is actively involved in determining the members.

Mr. MYERS. The three of you have been here for two-and-a-half hours and your supporting cast back here. We apologize for I think we had to leave several times to try to keep it going. We have all got a lot of questions left that we should be asking, but in the interest of time and your patience, you talk about our patience, you have certainly been patient today.

We all have a lot of questions about the future of not only DOE but the future of energy needs for our country and for the world, and so we are deeply concerned about it. We will have to work together very closely, but we do appreciate very much your cooperation and your testimony today.

If you will answer the questions we send to you, we would appreciate it.

Thank you very much for the job you are doing and welcome aboard.

Dr. MacLachlan. I am glad to be here.

Mr. Myers. You may wish you were back in DuPont before you are out of here.

Dr. MacLachlan. No way.

Mr. Myers. The committee will stand adjourned until 10:00 Tuesday on the 14th, is it?

Thank you all. Sorry to keep you so long.

[The questions and answers follow:]

GENERAL

Mr. Myers. Have we found the top quark?

Dr. Krebs. Yes, we have found the top quark. The evidence for it is quite compelling; there is only about one chance in a million that we could be wrong.

Mr. Myers. What is the next priority for the physics community?

Dr. Krebs. After the discovery of the top quark, the next priority is to study its properties. We need to know more about its mass, lifetime, decay modes and production properties. For example does the top quark decay into something unusual, or does it conform to our preconceptions based on the well established theoretical edifice known as the Standard Model of Elementary Particles? The Tevatron at Fermilab, with the additional capabilities provided by the Main Injector which is under construction, will enable us to make these and other related measurements more rapidly and with higher precision. As we firmly establish the properties of the top, we can begin to focus on other important questions: Does the Higgs boson, a key prediction of the Standard Model and thought to be the basis of the mass of elementary particles, exist and what are its properties? Can we decipher the phenomenon known as CP-violation, the physical principal which explains why the universe is made of matter instead of anti-matter? The B-factory which is under construction at the Stanford Linear Accelerator Center is specially designed to investigate this question.

The Standard Model has been very successful; so far, all of its predictions agree with experimental results. However, it is not complete; for example, it does not explain why the families of six quarks (the top quark was the last of the six to be discovered) and six leptons appear to be the basic constituents of matter. Experiments to probe the correctness of the Standard Model, such as studies of rare decays of particles called K mesons, will have high priority. In general, the long range program will address the question of where does the Standard Model break down, as we know it must, and how?

Mr. Myers. One of the recommendations of the Galvin report was that national laboratories should focus their activities on DOE's primary missions. Could you address those research areas where the Department is either the leader or a primary contributor to the U.S. scientific program?

Dr. Krebs. Research programs of the Department of Energy are distinguished as either world leaders or primary contributors in six distinct areas of science. The disciplines range from the most fundamental of sciences -- high energy physics -- to those of everyday importance, such as materials science.

Specifically, the Department of Energy is a world leader in the physics and engineering of fusion power, including the engineering of large-scale, high field superconducting magnets and the networking of high speed, high performance computers that form the backbone of the Internet.

The Department is the world's leader in high energy physics. The DOE sponsors the powerful accelerators that have led to the verification of the theoretical edifice known as the Standard Model of Matter. This *tour de force* of theory and experiment represents an achievement of 20th century science that rivals relativity and quantum mechanics in its importance to our understanding of the world around us. Just as the former two revolutionized our thinking of ourselves and our universe, so might the Standard Model revolutionize the 21st century.

The Department is also a world leader in mapping the structure of human DNA. Without the pioneering work of the Department there would not be a coherent appreciation of how genetic material mutates and propagates through the life chain. The DOE developed the sophisticated techniques that determine the effects of low-level radiation on genetic mutations. These techniques have allowed the Human Genome Program to proceed, with all its promise of providing an understanding and possible elimination of many diseases, including cancer.

In the atmospheric sciences, the Department has pioneered in the development of global climate modelling and prediction and is an acknowledged world and national co-leader whose contributions are essential to continued progress in this field.

The Department of Energy is a world co-leader in materials science. The work that it supports has led, for example, to the development of carbon composites that made possible the Stealth fighter/bomber and numerous consumer products that are part of our everyday lives.

Finally, the Department has been in the forefront of the computer revolution since the very first days of the programmable computer concept. The Department of Energy programs have been essential to the growth of the supercomputer industry, the Internet, and the software to support them. The needs of the DOE have been, and continue to be, the impetus for the continued evolution of large-scale, high-speed, computing in the nation.

Mr. Myers. What role does the university community play in the Department's basic research programs?

Dr. Krebs. The university community complements the national laboratory component of the Department's basic science program. It represents roughly 20% of the total research effort supported by the Office of Energy Research, excluding the funds for user-based facilities made available through DOE to the national scientific community.

The university programs are for the most part individual efforts that identify and amplify areas of science that interest and motivate the principal investigator. They are often characterized as "curiosity-driven," to distinguish them from the more "needs driven" work in the national laboratories. Curiosity driven research follows the tradition of conventional science where the results of one line of investigation may suggest new and potentially more important areas to explore. It has been the wellspring of all that we know that is new in science. Notable examples of single investigator research include the theory of relativity, the quantum theory, the transistor, the laser, the cat scan, and DNA -- to mention only a few of the accomplishments of 20th Century basic science. Translating these discoveries, that are the direct result of basic research, into fuel for the engine that drives our post-industrial economy is the role of our national laboratories and their industrial partners.

Mr. Myers. What is your perspective on the effectiveness of the collaboration between the national laboratories and the university community?

Dr. Krebs. The multi-purpose laboratories emphasize large-scale, multi-disciplinary problems of national interest that build on the efforts and the initiative of the curiosity driven efforts in the university community. Often, curiosity-driven research cannot be identified directly with near-term national needs, but, if the past 50 years is any guide, they will lead to breakthroughs that will alter our economy in the next Century. Consequently, the national laboratories continuously interact with the universities through ad *hoc* cooperative programs, formal personnel exchanges (the Intergovernmental Personnel Assignment program and graduate student internships), and a host of like programs that help both communities collectively identify ways to sharpen focus on problems of national interest. This dynamic, interactive, and ever-evolving balance between curiosity driven, university research and mission driven laboratory research is the very life blood of the scientific process that has made this nation the envy of the world's scientific community.

Mr. Myers. One criticism of the Department that we are hearing from a variety of sources (including the Galvin and Drell committees) is the excessive micromanagement of the laboratories by the Department. What action is being taken to respond to this concern?

Dr. Krebs. We clearly recognize that over many years, the Department's oversight processes at the labs have generated requirements through the issuance of a multitude of internal directives and the performance of many uncoordinated and duplicative reviews of the labs that can justifiably be characterized as micromanagement. In this regard, DOE has taken several steps to reduce micromanagement and evolve to a performance based management system based on best commercial practices. Some examples of actions taken by DOE, to date, in order to address this issue of micromanagement include:

Audits and Reviews:

The Department has committed to changing the way we perform audits/appraisals at the labs since we realize that the oversight process utilized by the Department today is too costly and ineffective. DOE will immediately adopt a plan to reduce the number of audits/appraisals being performed at the labs in order to minimize the impact such reviews have on the research. DOE has placed a moratorium on business reviews at the labs while we develop a plan to consolidate all business reviews into one integrated appraisal to be conducted at each lab once a year. This action could significantly reduce the number and increase the effectiveness of reviews conducted at a lab, and therefore, reduce the excessive oversight to the lab. Similar efforts are underway in the areas of ES&H and technical program reviews.

DOE Orders:

DOE has committed to review all of its orders to eliminate unnecessary and burdensome requirements imposed on the labs through the Department's directives system. DOE has accelerated its work in this area through process improvement teams that involve both DOE and lab personnel. Many offices have already achieved significant reductions in the number and volume of orders for which they are responsible (e.g., Human Resources - 51%). The ultimate goal is to reduce the orders within the Department by 60%, and to focus on real requirements.

Laboratory Procurement Systems:

DOE is in the process of changing the requirements related to our contractors procurement systems from the "federal norm" to best commercial practices. This change to best business practice is clearly going to result in a cost savings which will lead to increased dollars for the lab's research programs, since the cost of many procurement actions is borne directly by the program.

Mr. Myers. The Laboratory Directors told the Galvin Task Force that they could reduce costs by 10-40% with less oversight from the Department and fewer audits. The Secretary has committed to reduce excess oversight. Are you prepared to reduce funding for laboratory programs in fiscal year 1996 as a result of this initiative?

Dr. Krebs. In February 1995, the Secretary committed to contribute $10.4 billion toward President Clinton's plan to provide tax relief to middle-income working taxpayers and to reduce the nation's budget deficit. Savings from working smarter, cutting waste and bringing down costs are expected to save billions over the next several years. Such savings are expected to come from a number of initiatives, including contract reforms and environmental management programs, Galvin Task Force recommendations such as reducing excess oversight, and realignment.

The contributions from implementing Galvin Task Force recommendations are expected to be substantial over time but have not yet been quantified. Consideration will be given to incentivizing DOE contractors through rewards for cost reductions over a specific level; and researchers by permitting some portion of program savings to be reinvested in research. The FY 1996 request does include an undistributed $50,000,000 reduction in the Energy Supply Research and Development appropriation. Upon completion of the Galvin Task Force, the Secretary of Energy Advisory Board Task Force on Strategic Research and Development

(Yergin Task Force) and the President's Committee of Advisors on Science and Technology reviews, this reduction will be distributed to specific programs. It is anticipated that some portion of the $50,000,000 reduction will be transferred to other appropriations since not all laboratory savings will be realized in the ESR&D appropriation.

Mr. Myers. How is the basic research on environmental issues performed by your office coordinated with the long-term technology needs of the environmental management program?

Dr. Krebs. A number of activities are currently underway to improve the coordination between the Environmental Management program and the Energy Research program. The Assistant Secretary for Environmental Management, Mr. Thomas Grumbly, and I are engaged in active dialogue focused on this specific issue. I have asked that the Federal Advisory Committees of the program offices within the Office of Energy Research evaluate the ways in which the research supported by Energy Research currently meets the needs of Environmental Management and have urged these distinguished scientists to suggest directions in which the fundamental science/applied science coordination can be strengthened.

In May 1994, we held a workshop to focus on improving communication and programmatic coordination between the Office of Environmental Management and the Office of Energy Research. This workshop was attended by senior administrators in both Offices and by program staff of both Environmental Management and Energy Research, and there was clear and detailed discussion as to the needs and capabilities of each Office. There have been several follow-up meetings to this workshop.

Mr. Myers. How much are you spending on basic environmental research issues which are applicable to the long-term knowledge needs for cleanup technologies?

Dr. Krebs. Within the Office of Energy Research, the Biological and Environmental Research (BER) program, and Basic Energy Sciences (BES) program, each support research applicable to the long-term knowledge needs for cleanup technology. Foremost in this effort is the BER program, providing $95,080,000 in FY 1995, in direct support of research focused on cleanup technology development (including $40,000,000 in construction of the Environmental Molecular Sciences Laboratory and $55,080,000 in support of research that contributes to the development of cleanup technologies). Programs within BER that are involved in these efforts include elements of the Subsurface Science Program, the Microbial Genome Initiative, and elements of the Analytical Technology, Health Effects, General Life Sciences, and Ecological Effects subprograms. In FY 1995, BES is providing $13,375,000 for research that contributes to cleanup technologies, most of which is in the Chemical Sciences subprogram activities in actinide chemistry and in the chemical and physical phenomena that govern interaction and separation of contaminant species, and in the Applied Mathematical Sciences subprogram which supports access to supercomputers for environmental modeling, and the development of software tools for analysis and modeling of contaminant flow.

Another $4,125,000 in ER-program funding supports technology transfer activities. Thus, in FY 1995, the Office of Energy Research is providing $112,580,000 in support of research applicable to the long-term knowledge needs for cleanup technologies. These activities will continue in FY 1996, as reflected in the following table.

BASIC RESEARCH IN SUPPORT OF ENVIRONMENTAL RESEARCH/WASTE MANAGEMENT

	(B/A in Millions)	
	FY 1995	FY 1996
BIOLOGICAL & ENVIRONMENTAL RESEARCH	$ 95.1	$ 100.1
(ENVIRONMENTAL MOLECULAR SCIENCES LAB)	(40.0)	(50.0)
BASIC ENERGY SCIENCES	13.4	19.1
(APPLIED MATHEMATICAL SCIENCES)	(3.9)	(6.8)
TECHNOLOGY TRANSFER	4.1	8.9
TOTALS	$112.6	$128.1

Mr. Myers. The Department operates many user facilities. Are any fees charged to universities or commercial businesses which use the various facilities?

Dr. Krebs. In a typical year, thousands of researchers from industrial, academic, and federal laboratories conduct research at these facilities. Based on the scientific quality and importance of proposed experiments, free operating time is available to researchers who publish their results in the open literature. Proprietary research is accommodated on a full cost recovery basis. Research that can be carried out using commercially available facilities or services is not appropriate for scheduling at DOE facilities. The Office of Science and Technology Policy will be reviewing the policy on user fees in the next few months.

Mr. Myers. How does the Department coordinate the development, operation and construction of research facilities with the National Science Foundation or other federal agencies involved in similar research fields?

Dr. Krebs. In the recent past, the Department's coordination with other federal agencies has been effected through the Federal Coordinating Council for Science, Engineering, and Technology Committees. Now it is coordinated through the National Science and Technology Council's Committees.

In addition, at most existing facilities, new proposals for use are considered by teams composed of industry representatives, DOE laboratory representatives, and representatives of other government laboratories or agencies such as the National Institute for Science and Technology. Each facility prepares yearly reports on research activities which are distributed widely.

With respect to coordination with the National Science Foundation, the Department's plans for new facilities in High Energy Physics and Nuclear Physics are coordinated through advisory committees. The Nuclear Sciences Advisory Committee is a joint Department of Energy and National Science Foundation advisory committee. The High Energy Physics Advisory Panel is advisory to both agencies and the National Science Foundation participates in its hearings. Both advisory committees identify scientific opportunities and priorities in research and recommend a long-range plan to provide a framework for coordinated advancement of the nation's research program in these disciplines.

Mr. Myers. Why isn't the electric magnetic field effects program considered part of the medical effects program managed by the Office of Energy Research?

Dr. Krebs. The reason for this is primarily historical. Public concern about possible health effects first arose when epidemiological studies indicated that there might be an association between health impacts and exposure to public power lines. This public concern about public power line siting was of considerable interest to the part of the Department responsible for electrical transmission (now the Assistant Secretary for Energy Efficiency and Renewable Energy, [EE]). Considerable uncertainty continues to exist regarding the possible biological mechanisms by which electric magnetic fields (EMF) might induce the purported effects, such as leukemia and brain tumors in children and adults, as well as the reproducibility of the epidemiological observations. It was agreed that the Office of Energy Research (ER) would support longer-term basic research into possible biological mechanisms and Energy Efficiency would support shorter-term research (including animal studies) aimed at validating the epidemiological studies. For several years, ER supported basic research into possible mechanisms by which electric magnetic fields might impact human health. ER's Biological and Environmental Research program's health effects activities are being restructured with the aim of incorporating technologies and information from the Human Genome Program to develop new approaches to risk estimation at the level of the individual. These approaches may, in the future, provide better information regarding possible EMF health effects. Currently, the Department (EE) administers the overall EMF Research and Public Information Dissemination Program and directs research on exposure assessment and field management techniques. The National Institute of Environmental Health Sciences directs the risk assessment and health effects research.

Mr. Myers. For each multipurpose energy laboratory or single purpose laboratory or facility under the direction of the Office of Energy Research, please provide the environment, safety and health costs for fiscal years 1994, 1995, and 1996.

Dr. Krebs. ES&H funding for laboratories under the purview of Energy Research for Fiscal Years 1994, 1995, and 1996 is provided in a table which I would like to insert in the record. Note that these figures represent both direct and indirect funding. The information follows:

ENERGY RESEARCH ES&H ACTIVITY FUNDING
(B/A in Thousands)

SITE	FY 1994	FY 1995	FY 1996
Ames Laboratory	$ 2,093	$ 2,448	$ 2,399
Argonne National Laboratory-East	28,216	32,563	35,195
Brookhaven National Laboratory	28,882	32,916	36,310
Continuous Electron Beam Accelerator Facility	2,631	2,968	3,338
Chicago Operations Office	772	1,030	1,049
Environmental Measurements Laboratory	630	592	487
Fermi National Accelerator Laboratory	16,983	17,761	16,735
Inhalation Toxicology Research Institute	1,592	2,219	2,319
Los Alamos National Laboratory	6,514	6,797	10,068
Lawrence Berkeley Laboratory	22,788	25,502	28,393
Lawrence Livermore National Laboratory	1,632	2,052	2,039
Oak Ridge Operations Office	84	85	169
Oak Ridge Institute for Science and Education	997	1,430	1,099
Oak Ridge National Laboratory	98,168	96,272	103,023
Pacific Northwest Laboratory	18,933	19,527	23,664
Princeton Plasma Physics Laboratory	5,435	5,784	6,258
Oakland Operations Office	134	141	141
Stanford Linear Accelerator Center	8,014	8,547	9,491
Superconducting Super Collider Laboratory	6,577	5,076	0
TOTAL	$251,074	$263,711	$282,174

Mr. Myers. Has there been any attempt to prioritize corrective activities required by past "tiger team" reviews?

Dr. Krebs. Yes. Energy Research, along with many other DOE programs, uses the DOE-established Risk-Based Priority Model (RPM) to prioritize ES&H activities. The RPM has been successfully used by Energy Research, at both the program and field levels, to prioritize ES&H activities in the last three budget planning cycles. These activities include outstanding Tiger Team corrective actions as well as other ES&H issues which have surfaced more recently.

Mr. Myers. Are ES&H activities being directed on the basis of those original reviews?

Dr. Krebs. Yes. Outstanding corrective actions from the original Tiger Team reviews continue to be addressed according to their relative priorities. The Risk-Based Priority Model allows us to prioritize all current ES&H activities in an integrated fashion.

Mr. Myers. Why does the Office of Energy Research have a separate office of ES&H technical support when the Department has a large ES&H organization to provide guidance to the laboratories?

Dr. Krebs. The Department's Assistant Secretary for Environment, Safety and Health develops overall ES&H policy for the Department and provides centralized oversight of DOE-wide operations for the Secretary. However, the safe and environmentally acceptable operation of research programs and scientific facilities must be carried out by program offices such as the Office of Energy Research. Energy Research manages some of the largest, most complex forefront scientific research programs and facilities in the world. These programs span a broad range of scientific disciplines and present unique ES&H challenges. Energy Research's Office of ES&H Technical Support adapts the Department's ES&H policies to the specific unique needs of Energy Research's programs. It also provides the technical expertise required to support the needs of the Energy Research programs to help them operate their programs and facilities in a safe and environmentally acceptable manner, thus, ensuring compliance with ES&H regulations. Because of the broad range of technical competencies required, it would be inefficient to replicate them in each of the individual Energy Research program offices.

Mr. Myers. How many employees and what is the funding for this activity?

Dr. Krebs. The Office's allocated staffing level is 19 FTEs at an FY 1996 cost of approximately $2.3 million for salaries, benefits, travel and related support. There is an additional $2.4 million budgeted for ES&H contractual support.

Mr. Myers. Why have the full-time employees in the General Science Program Direction account increased from 75 in fiscal year 1994 to 89 in fiscal year 1996?

Dr. Krebs. The full-time equivalents (FTE) allocated to the General Science Program Direction account actually increased from 82 in FY 1994 to 89 in FY 1996. Because of a number of vacancies in FY 1994, only 75 FTEs were actually expended in that year. The increase in FTEs allocated to this account result from an increase in construction project management for the B-Factory, Relativistic Heavy Ion Collider and Main Injector projects and an increased workload on High Energy Physics staff resulting from Superconducting Super Collider Project termination.

Mr. Myers. Are colleges and universities producing more physics graduates than can currently be absorbed in the field?

Dr. Krebs. Physics Ph.D. awards have increased in recent years by over 20 percent for U.S. citizens and permanent residents since 1980. The total Ph.D. degrees awarded increased from 657 in 1980 to 805 in 1993. The growth in employment opportunities for physicists since the end of the cold war has not kept pace with this degree of growth. As a result, unemployment (although relatively low) has grown. Many new physics Ph.Ds. who are employed are taking longer to find work, are accepting more temporary positions, and are taking jobs outside of the physics field (e.g., in computer applications and engineering). Data from the American Institute for Physics indicates that the proportion of new Ph.Ds taking more than six months to find employment has increased from about 15 percent during the 1980s to more than 20 percent in 1992. This increased difficulty in finding employment also holds for BS/MS physics degree recipients.

In summary, physics graduates are being absorbed into employment, although many are disappointed in having to accept positions outside their field in other technical employment or temporary positions. However, I also believe that the country and our economy will broadly benefit if these talented young people, familiar with scientific research, make contributions to other difficult questions facing our nation. Research training in physics and other scientific disciplines needs to be seen by students, their advisors and the broader public as a starting point for careers and contributions.

HIGH ENERGY PHYSICS

Mr. Myers. The report of the Advisory Panel on the Vision for the Future of High Energy Physics (referred to as the Drell Report) was issued this past year. Could you summarize the key findings?

Dr. Krebs. The first recommendation of the Drell Report is that the U.S. should continue to be among the worldwide leaders in the pursuit of answers to fundamental questions of particle physics.

The second recommendation is that the federal government should commit itself to a constant-level-of-effort budget, based on the FY 1995 request, plus a 3-year $50,000,000 year supplement, beginning in FY 1996, in order to allow productive use of existing facilities and flexibility to pursue new ideas, allow significant participation in the Large Hadron Collider (LHC) accelerator and detectors, and support an enhanced accelerator R&D effort.

The third recommendation is that if there is a 3-year $50,000,000 per year supplement and a commitment for constant-level-of-effort funding thereafter, then the U.S. should declare its intention to participate in the construction of the LHC and initiate negotiations toward that goal.

The fourth recommendation is that the government should seriously consider restoration of full authorization at the start of major scientific construction projects, as well as introduce two or more year budget cycles.

The Subpanel also recommended that if there is no 3-year $50,000,000 supplement, DOE should convene another HEPAP subpanel (jointly with NSF) to recommend program changes. However, even at a constant FY 1995 level of effort budget, the subpanel still endorses initiating negotiations toward joining the LHC collaboration.

The Subpanel also recommended that proposals for scientific missions for the former SSC site should be stringently peer reviewed, and timely decisions made on the disposition of movable equipment.

Mr. Myers. Were the conclusions of the Drell report incorporated into the Department's FY 1996 Budget?

Dr. Krebs. Yes, the recommendation with regard to funding is reflected in the FY 1996 budget.

Mr. Myers. What is the Department's current proposal to participate in the Large Hadron Collider (LHC)?

Dr. Krebs. Discussions with CERN about U.S. involvement in the LHC are in a very early stage and no agreement has been reached. Thus it is not possible to give a definitive answer at this time.

Possible U.S. roles in the LHC project include work on both the machine and on the two large colliding beam detectors which are planned. In any of these areas, U.S. participation would involve a mix of R&D, design, fabrication and operations efforts probably focussed on specific subsystems. Technical areas of the machine that have been explored include: beam transfer lines, superconducting magnets, beam control and measurement, and portions of the machine control systems. In the detector area, the possibilities include the muon detection subsystem, portions of the various calorimeters, and aspects of the data acquisition subsystems.

Mr. Myers. Has agreement on U.S. participation in this collaboration been finalized?

Dr. Krebs. Discussions are planned to formulate the basis for negotiations, but no agreement has been reached on the extent or the specifics of any collaborative effort.

Mr. Myers. What funding is included in this budget request, and what level of funding do you expect for the future U.S. effort?

Dr. Krebs. The FY 1996 budget requests $6,000,000 for support of R&D relating to possible involvement in the LHC. If a satisfactory agreement is reached on U.S. participation in the LHC, we anticipate that the LHC funding may grow over several years to the $30,000,000 to $50,000,000 a year level.

Mr. Myers. One of the recommendations of the Drell report is to evaluate whether the balance between the national laboratories and the university research programs is optimal. What is the Department doing to address this recommendation?

Dr. Krebs. The High Energy Physics Advisory Panel, at its most recent meeting, began a consideration of the health and vitality of the university portion of the DOE supported HEP program and its relation to the national laboratory portion of the program. After discussion, the Panel established a subcommittee to collect relevant information and scheduled an extended discussion at its next meeting.

Mr. Myers. The proposed Science Facilities Initiative is targeting $15 million for the High Energy Physics program. What impact would this increase in funding have on the operating time of the machines at Stanford Linear Accelerator Center (SLAC), Fermilab and Brookhaven National Laboratory in fiscal year 1996 as compared to the two previous years?

Dr. Krebs. The $15,000,000 for the Science Facilities Initiative in the FY 1996 request will provide for the following running time at the three laboratories:

HIGH ENERGY PHYSICS

Operating Time in Hours

Laboratory	FY 1994	FY 1995	FY 1996
Fermilab	4,165	3,936	4,400
Stanford Linear Accelerator Center	6,200	4,200	5,925
Alternating Gradient Synchrotron at BNL	1,750	1,680	2,200

Mr. Myers. Are these the maximum operating levels for these facilities?

Dr. Krebs. These are less than the maximum operating times at all three facilities as indicated below:

	FY 1996 Operating Time in Hours	Maximum Hours Possible
Fermilab	4,400	5,896
Stanford Linear Accelerator Center	5,925	7,000
Alternating Gradient Synchrotron at BNL	2,200	2,500

Mr. Myers. Is there demand from the scientific community for the use of the DOE facilities which exceeds what is available?

Dr. Krebs. At all three of the HEP facilities the user demand for additional running is significantly beyond that which is planned.

NUCLEAR PHYSICS

Mr. Myers. Have construction activities of the Continuous Electron Beam Accelerator Facility (CEBAF) been completed and is the facility operating?

Dr. Krebs. No, but the CEBAF project is expected to be complete in 1995 in accordance with the approved rebaseline of August 1991. Progress has been sufficient to begin the first scientific experiments in April 1995.

Mr. Myers. Was this construction project completed on schedule and within budget?

Dr. Krebs. The project costs will be within the rebaseline profile of August 1991. The milestones set by that document have been or will be met.

Mr. Myers. The FY 1996 budget indicates that the operation of the LAMPF facility at Los Alamos will be transferred to Defense Programs. What is the rationale for this transfer?

Dr. Krebs. Operations of the LAMPF accelerator has been transferred from ER to DP in accordance with the highest priority research to be supported by the facility. In 1992, the Nuclear Science Advisory Committee (NSAC) recommended that LAMPF be operated through FY 1995 to complete a high priority agenda. For the following years, NSAC recommended that "construction of the new major facilities, CEBAF and RHIC, be completed without further delays, so that they may start their important research programs in a timely fashion."

Defense Programs will operate the LANSCE facility to support neutron scattering research for the science-based stockpile stewardship program. In addition, depending on availability of R&D funding for the accelerator production of tritium (APT) program, high intensity beams may also be provided through the main nuclear physics experimental area to the primary beam stop.

Mr. Myers. Will the Nuclear Physics program use this facility in fiscal year 1996?

Dr. Krebs. The Nuclear Physics program will not be involved in further operations of the accelerator, but will be supporting research at the facility depending on availability of beams. In FY 1996, support will be continued for the LANL-University collaborative TRIPLE experiment at LANSCE, which investigates parity violating forces in nuclei. Also at LANSCE, support will be provided for a new beam line using ultra-cold neutrons to measure fundamental properties of the neutron, such as its half-life and dipole moment.

If a beam is provided by Defense Programs to the primary beam stop, university and LANL scientists will be supported to continue some existing experiments in the main nuclear physics area. Of special interest may be the continued examination of possible neutrino oscillations by the LSND experimental team. If this beam is not available, these funds will be used to conclude the experiments, analyze and publish existing data, and prepare to transfer unique and valuable equipment to other nuclear physics facilities. For example, the neutral meson spectrometer would be moved to experiments at the Brookhaven AGS and later at CEBAF.

Superconducting Super Collider

Mr. Myers. What is the status of the termination activities for the SSC? Are there any funding issues still unresolved?

Dr. Krebs. The SSC Termination continues to be on schedule and within the budget estimate for the defined termination scope. Major milestones have been accomplished as follows:
personnel demobilization has occurred ahead of schedule; technical close-out activities are complete except for records disposition; subcontract close-out activities are on schedule and of the 20 major subcontracts terminated, 16 settlement proposals have been received, three are due in March 1995, and one proposal has been settled; property dispositions were delayed pending the Texas Settlement, but are expected to be completed in 1995; initial site stabilization was completed on schedule and a program plan for site restoration was provided to Texas for comment in December 1994; project definition studies for future on-site use of assets and DOE evaluation of these studies have been completed.

It presently appears that implementation of the settlement and the project termination process can be accomplished within existing SSC appropriations. However, there are still some risks in view of substantial uncertainties, especially regarding the close-out of large subcontracts and the outcome of potential litigation. The Department is making every effort to keep the termination costs within existing SSC appropriations. The Department does not anticipate making any special requests for additional appropriations to support termination or future potential uses of assets at the SSC site. The SSC termination activities continue to be on schedule and within the budget estimate.

There is an additional issue which is outside the defined scope of the termination project. A number of local entities are seeking payments from DOE to offset alleged negative impacts from the decision to terminate the project. The current total of such claims is approximately $30 million. The analysis of the claims is underway and no determination as to merit has yet been made.

Mr. Myers. Have the negotiations with the state been finalized?

Dr. Krebs. A Settlement Agreement was signed by the Department and the State of Texas in November 1994, and a Closing, which implemented formal transfer of property to the Texas National Research Laboratory Commission, was held on December 1, 1994. A transition period in which DOE provided practical assistance to Texas during the property transfer ended on January 31, 1995. This was an important step in the termination process, a necessary ingredient for the swift, efficient, and environmentally sound termination of the project. The agreement resolves claims made by the State, thereby avoiding litigation, and provides the basis on which the use and value of existing Collider assets can be maximized. It provides for an equitable distribution of property between the Department and the State, taking into account the respective Federal and State investment in the project.

Mr. Myers. How are the outplacement efforts for the impacted employees, DOE and contractor, progressing?

Dr. Krebs. The SSC Laboratory total population, which includes Universities Research Association, Inc. and EG&G, Inc. employees, temporary employees, consultants, and on-site vendor representatives, has been reduced from 2,328 at the time of termination to 416 as of January 31, 1995. This number is projected to decrease to 364 by March 31, 1995, and to approximately 50 by the end of September 1995. This number will steadily decrease in fiscal year 1996 with the SSC Laboratory on-site presence expected to end not later than September 1996.

In addition to the SSC Laboratory employees, there are currently 36 DOE employees at the site (down from 61 at the time of termination), 12 DOE support service contractor personnel and 8 MK-Ferguson employees. MK-Ferguson is the contractor performing site restoration activities. These number are projected to decrease through fiscal year 1995 and fiscal year 1996 with the DOE presence also expected to end not later than September 1996.

Most departing DOE employees have received offers of employment from other DOE locations, however several have received offers of employment from other Federal agencies in the Dallas-Fort Worth metroplex. Several employees have chosen retirement and a few have received offers of employment from private industry. On-site outplacement efforts are supported by Career Transition Specialists from the Office of Personnel Management.

Outplacement of contractor personnel appears to be progressing satisfactorily. The contractor established an outplacement center that recorded almost 37,000 visits from December 1993 through February 1995. Eight job fairs were held resulting in 418 job offers. A number of employees found work through other means, in many cases returning to their previous employer.

BASIC ENERGY SCIENCES

Mr. Myers. You have indicated that the Department has changed its strategy for future neutron sources with the cancellation of the Advanced Neutron Source project. You are proposing to begin research and development activities for a spallation neutron source. Please provide a comparison between the relative capabilities of the Spallation Neutron Source and the Advanced Neutron Source including technology features and cost.

Dr. Krebs. The Spallation Neutron Source is an accelerator-based source which would provide very intense, very short duration (in time) beams of neutrons. The neutrons produced from a spallation source generally have higher energies, but are at a disadvantage for experiments which require cold, long wavelength neutron beams. The pulsed time structure of the neutron beams would enable the study of time-dependent phenomena in solids, complex fluids, and other materials. It would not produce medical isotopes or be useful in radiation damage studies.

The Advanced Neutron Source as designed was a reactor-based, steady-state source of neutrons which was to provide more intense beams of neutrons than any other in the world, and would have been especially useful in its production of intense beams of cold (long wavelength) neutrons used for the study of polymers, biological molecules, and submicron structures in materials. The Advanced Neutron Source would also have had the ability to produce certain medical isotopes, and to conduct radiation damage experiments using the very intense neutron irradiation capability.

The conceptual design and other detailed cost estimates for the Advanced Neutron Source set the cost of the Advanced Neutron Source at $2.9 billion. A detailed conceptual design has not been carried out for the Spallation Neutron Source yet, but it is estimated to cost in the neighborhood of $1 billion.

Mr. Myers. Will the Spallation Neutron Source project keep U.S. scientists on the cutting edge of neutron scattering research?

Dr. Krebs. Yes. The proposed Spallation Neutron Source would be a substantial leap forward in the U.S. capability to do neutron scattering research and would be better than any existing spallation source in the world.

Mr. Myers. Are other options being considered by the Department to address this need of the scientific community?

Dr. Krebs. The Department is considering other options to meet the needs of the U.S. scientific community. Among these are the potential upgrading of the High Flux Beam Reactor and High Flux Isotope Reactor as was done recently at the Institut Laue Langevin at Grenoble, France (ILL). Such upgrades would make the High Flux Beam Reactor and the

High Flux Isotope Reactor equivalent to the world's best research reactor at ILL in a cost-effective way.

Mr. Myers. What is the connection and relationship between the Spallation Neutron Source project and the proposed Accelerator Production of Tritium project?

Dr. Krebs. A response to this question is under preparation. The answer will be provided as soon as possible.

Mr. Myers. An Environmental Impact Statement will be completed this year which will address whether accelerator or reactor technology should be used for tritium production. What will be the impact on the Spallation Neutron Source project if the accelerator technology is not selected for tritium production?

Dr. Krebs. While much of the R&D for the Spallation Neutron Source project and the proposed APT project is overlapping and would be shared, the Department had envisioned these two projects as separate in location and function. If the APT project does not go forward, the impact would be felt in the area of R&D where the Spallation Neutron Source would have to go it alone.

Mr. Myers. Specific cost impacts?

Dr. Krebs. If an Accelerator Production of Tritium project does not proceed, we estimate that the Spallation Neutron Source project will require about $20-$30 million for R&D that would have been shared with the Accelerator Production of Tritium project.

Mr. Myers. With budget constraints facing the Department, will DOE continue to support this project if Defense Programs does not pursue the accelerator option for tritium production?

Dr. Krebs. Yes. The Department of Energy will continue to support this project which should enable the nation to carry out major research activities in areas such as biology, materials science, superconductivity, pharmaceuticals, electronic materials, and many other technological areas that are critical for future U.S. economic competitiveness and national security.

Mr. Myers. What is the Department's strategy for future isotopes production since the Spallation Neutron Source will not have the capability to produce isotopes?

Dr. Krebs. The Department will continue to serve its isotope customers by delivering products and services from our production facilities at six locations: the Brookhaven National Laboratory, EG&G Mound Applied Technologies, Idaho National Engineering Laboratory, Los Alamos National Laboratory, Oak Ridge National Laboratory, and the Hanford Reservation. Additionally, a reactor at the Sandia National Laboratory in New Mexico is expected to produce medical isotopes beginning in 1996.

The reactor facilities at the Idaho National Engineering Laboratory and the Oak Ridge National Laboratory, and the planned isotope production facility at the Sandia National Laboratories will provide the necessary neutron sources for radioisotope production. Spallation technology development will be monitored for potential production in the future.

The Department's National Isotope Strategy, issued in August 1994, provided fuller descriptions of the plans for producing isotopes. A copy of this publication is being provided to the Subcommittee staff.

Mr. Myers. The Department is requesting $60 million for a new initiative, Science Facilities Utilization Enhancement. You have indicated that this initiative will increase the number of users at the DOE facilities by 30 percent. Will this take care of the demand from the universities and industry?

Dr. Krebs. This enhancement will go a very long way toward meeting the demand for use of these facilities.

Mr. Myers. Has there been any change in the trend of users at the Department's facilities during the last five years?

Dr. Krebs. The main change has been the total increase in the number of users. In 1990, there were about 2,400 users. In 1994, there were about 4,565 users. Industrial users increased from about 500 in 1990 to about 600 in 1994. University users increased from about 1,200 in 1990 to about 2,300 in 1994.

Mr. Myers. If these users cannot get machine time at the DOE facilities, where do they go?

Dr. Krebs. Some users who cannot get access to the Department's neutron scattering facilities were able to use the facility at the Institut Laue Langevin in France in past years. Similarly, there have been users at the ISIS facility in Great Britain. Some users have also used the reactor at the University of Missouri. Some synchrotron users use the synchrotron light sources at the University of Wisconsin and Cornell University. Some users of electron beam microcharacterization facilities use various instruments in the U.K., The Netherlands, and Japan. It is common for users of domestic user facilities to experience excessive time delays in gaining access to these user facilities. It has become increasingly difficult for scientific investigators from the U.S. to gain access to European facilities, which in themselves are oversubscribed and give priority access to their own citizens.

BIOLOGICAL AND ENVIRONMENTAL RESEARCH

Mr. Myers. Please describe the current Boron Neutron Capture Therapy (BNCT) program.

Dr. Krebs. The boron neutron capture therapy research has rapidly moved into clinical trials. The Department is supporting research trials with brain cancer patients at the Brookhaven National Laboratory in collaboration with physicians at the Beth Israel Medical Center, New York City, and with skin melanoma patients at the Massachusetts Institute of Technology in collaboration with physicians at the New England Medical Center, Boston. These trials are very costly, and constrained budgets have caused the Department to reallocate some resources from preclinical studies to support them. However, innovative research is ongoing in the development of new boron-labeled drugs and studies of their toxicology and biodistribution in animals. In addition to the current DOE-supported preclinical research in these areas, the National Cancer Institute supports new drug development for use in neutron capture therapy.

Mr. Myers. What is the status of human trials?

Dr. Krebs. On September 13, 1994, the first patient since 1961 was given experimental boron neutron capture therapy for glioblastoma brain cancer. The experimental procedure was a collaborative effort between physicians at the Beth Israel Medical Center in New York City and staff at the Brookhaven National Laboratory. The therapy was administered under a single patient protocol that satisfied all requirements of the Food and Drug Administration. A multiple patient protocol has since been approved for a 28 patient clinical trial to test safety and efficacy with the first patient treated under this protocol on February 2, 1995. Initially, two patients per month will be given boron neutron capture therapy.

A second clinical trial is under way as a collaboration between the New England Medical Center and the Massachusetts Institute of Technology for melanoma skin cancer. The first of 15 melanoma patients was given therapy on September 6, 1994, and two others have been included since then under the Boston group's multiple patient protocol in compliance with the Food and Drug Administration requirements.

Completion of these clinical trials will indicate the safety and efficacy of this experimental approach to cancer and melanoma therapy. At present there is no indication that boron neutron capture therapy offers any advantage over conventional therapies.

Mr. Myers. What is the protocol for patients being accepted into the BNCT trials at Brookhaven National Laboratory?

Dr. Krebs. A medical team composed of Brookhaven National Laboratory staff and Beth Israel Medical Center physicians are administering boron neutron capture therapy to a total of

28 patients under the new research protocol. This multiple patient protocol was developed by a group of outstanding physicians that included neurosurgeons and radiation oncologists and expert scientists in radiation physics, health physics, and radiation biology. Patients are selected based on protocol criteria and consideration of the best medical treatment for each individual patient. The protocol criteria for this experimental therapy includes the patient's age, medical history, tumor size and location, and current health status. Decisions on patient treatment, as always, are made by the medical team physicians. Patients and their physicians who express interest in participating in this research trial are referred to Ms. Mona Rowe, the initial point of contact for the medical team through the Brookhaven National Laboratory (516-282-5056).

Mr. Myers. One of the recommendations by the Galvin committee is to use the expertise of the national laboratories to help solve the Department's cleanup problem. What is the current role of the national laboratories in cleanup research and technology development?

Dr. Krebs. Scientists at the national laboratories are actively involved in the conception, development, and application of environmental cleanup technologies, and they are involved with cleanup at all Departmental sites. For example, the Pacific Northwest Laboratory plays an important role in developing new *in situ* cleanup technology based on basic research sponsored by the Subsurface Science Program within the Biological and Environmental Research program, and the refinement, testing, and application of these technologies is undertaken at the Hanford site by Environmental Management. Although still housed in interim facilities, scientists from the Environmental Molecular Sciences Laboratory are focusing their multi-disciplinary research activities on solutions to fundamental problems that prevent efficient remediation and land restoration.

In general, with the support of the Biological and Environmental Research program and the Basic Energy Sciences program, the full range of fundamental research that is needed to address the Department's cleanup problems is ongoing at the national laboratories. With support from Biological and Environmental Research and Basic Energy Sciences, there is a strong tradition at the laboratories of instrument development for monitoring, remote sampling, and analysis of contaminants, as well as for the development of chemical and biological sensors that are needed both to monitor cleanup progress and to monitor the health and safety of workers actively involved in cleanup activities. Basic Energy Sciences supports a robotics program that should lead to the use of robots in tank cleanup (e.g., for safe sample handling), as well in other mixed waste depositories and contaminated physical plants. Scientists at a number of the Laboratories play key roles in the multi-disciplinary application of Biological and Environmental Research's programs in structural biology, the human and microbial genome programs, and the subsurface science program to enhance the cleanup capacity of bioremediation. Using the Applied Mathematical Sciences-supported supercomputer facilities at the national laboratories, much work is being done to model transport of subsurface contaminants and to evaluate alternative remediation strategies.

Mr. Myers. Do you see any opportunities to increase involvement of the laboratories in this endeavor?

Dr. Krebs. Yes, there are expanding opportunities to increase the involvement of scientists at the national laboratories in the efforts to solve the Department's cleanup problems. As the understanding of the true nature of the problems that we face is being developed, there is also growing realization and acceptance that the solutions to these problems will only come from a multi-pronged attack, using the full range of scientific and technological disciplines of the modern age. It is at the national laboratories that the range of expertise needed to attack these problems is resident, and while there is a broad range of expertise resident at each of the Laboratories, each of the Laboratories also has its own set of specialties. There is an urgency for bringing together specialists in one discipline with specialists from another discipline to attack the cleanup problems, and the truly synergistic approach that is necessary will never evolve in the academic or private sectors, but only in the national laboratory system. Indeed, there is increasing recognition by the individual laboratory scientists that their strengths grow when they collaborate with other scientists throughout the laboratory system. In recognition of both the importance of the national laboratories and the importance of the Office of Energy Research in pursuing research that will facilitate the Department's cleanup mission, I have asked the statutory advisory committees of the Energy Research program offices to examine our current activities in cleanup and to make recommendations as to additional (or other) activities that we should pursue. These committees are taking this charge quite seriously; for example, a subcommittee of the Health and Environmental Research Advisory Committee is engaged in direct dialogue with the Office of Environmental Management as to how our fundamental research programs and our laboratory scientists can best assist Environmental Management in cleanup activities.

Mr. Myers. Please elaborate on the proposed Environmental Technology Partnerships for the Bioremediation and Integrated Assessment Research Program.

Dr. Krebs. Under the proposed Environmental Technology Partnerships, Biological and Environmental Research will support fundamental research in two areas, a) bioremediation and biotechnology as applied to environmental problems and b) integrated assessments. In bioremediation/biotechnology, $4,000,000 will be used to support a range of experimental and computational structural biology studies focused on developing enzymatic systems and genetically engineered organisms that will be useful both in restoration of contaminated sites and in the management of waste stream effluents as they are produced. These studies would build on ongoing research supported by Biological and Environmental Research that focus on redesign of enzymes that will degrade a range of environmental toxins, in addition to a study on the degradation of contaminants by genetically-engineered bacteria. Biological and Environmental Research currently has a program in Global Change Assessment Research that supports projects focused on developing methodologies for integrated assessment of climate change in such areas as technology innovation and diffusion, non-market impacts of climate change, modeling, and economic forces that drive global climate change. Under the Environmental Technology Partnerships, $2,000,000 will be used to broaden integrated assessment research beyond global climate change and to develop methodologies for performing risk assessments of a variety of environmental insults.

Mr. Myers. Will this program be funded by multiple DOE programs?

Dr. Krebs. The proposed Environmental Technology Partnerships initiative is a joint venture between the Office of Energy Research and the Office of Energy Efficiency and Renewable Energy. Of the requested $39,720,000, $15,720,000 will be allocated to Energy Efficiency and $24,000,000 to Energy Research. Within Energy Research, the funding breakdown will be:

Basic Energy Sciences	$18,000,000*
Biological and Environmental Research	$ 6,000,000

*$3,000,000 of this is in the Applied Mathematical Sciences subprogram.

Mr. Myers. Will there be cost-sharing with industry?

Dr. Krebs. The Office of Energy Research will consult with industry for assistance in identifying areas of fundamental research that are most appropriately addressed by the Department but that will contribute to sustainable development and to pollution prevention technologies, as well as to remediation technologies.

Mr. Myers. What is the Department's fiscal year 1996 budget request for this initiative?

Dr. Krebs. As stated above, the fiscal year 1996 request is $39,720,000.

Mr. Myers. Please describe the new Computational Biology Research Program Initiative.

Dr. Krebs. The goal of the Computational Biology Research Initiative, which crosses all research activities in the Biological and Environmental Research program, is to link the ongoing revolution in the biological sciences with that in computer and information science, in order to understand, predict, and design the biological function and activity of biomolecules. Computational biology builds on several experimental, computational, and infrastructural strengths of the Department; the Biological and Environmental Research programs in genome and structural biology provide research expertise and a unique infrastructure for computational biology. The supporting infrastructure of the Department includes large-scale genome analysis facilities, data resources for biological information, advanced computing facilities, and the advanced synchrotron and neutron sources.

Mr. Myers. What is the objective of this initiative?

Dr. Krebs. The objective of this initiative is to link the revolution in computer and information science with the revolution in modern biology, using the tools of computational biology to provide insights into research problems too complex for traditional analysis. The inherent complexity of living systems makes the computer an ideal tool for research in biotechnology and fundamental biology.

Existing computational biology funding within the Biological and Environmental Research program includes research supported within the genome program, medical applications, and health effects. To understand and exploit the rapidly increasing structural biology and genome data, and expand our efforts to reach out to other Departmental Programs, a focused, integrated computational biology effort is required.

Mr. Myers. Will it support other Departmental Programs?

Dr. Krebs. Yes, the research developed through the computational biology program will support the needs of programs in Basic Energy Sciences, the Applied Mathematical Sciences, Energy Efficiency, Environmental Management, Biological and Environmental Research; it will also complement, but does not overlap, ongoing Computational Biology Programs and activities at the National Science Foundation, the National Institutes of Health, Office of Naval Research, and United States Department of Agriculture, which focus on their mission areas.

The ability to predict the functions of biological molecules will be a key factor in the application of biotechnology to diverse areas of national need, including the health consequences of environmental contamination, medical applications and molecular nuclear medicine, enhanced uses of bioremediation techniques, approaches to structure-based drug design and new DNA and protein based pharmaceuticals and agents for the diagnosis and treatment of cancer, the development and improvement of biofuels, and industrial processes. These studies will also complement research on understanding the response of organisms to environmental change, a biological component of the global change program.

Mr. Myers. What is the total cost?

Dr. Krebs. The $3,000,000 million computational biology initiative for FY 1996 will focus on understanding structural-function relationships in biology, providing an immediate opportunity for DOE that is unique in the federal government and that will address fundamental research problems that have direct, commercial implications. Given the critical, central role that it represents to the future of biology and technological developments in medicine, an expanded, ongoing effort in computational biology research must be an ongoing, expanding effort for the foreseeable future.

Mr. Myers. What is the DOE and NIH funding for the human genome program in fiscal years 1994, 1995, and 1996?

Dr. Krebs. The funding for the genome programs of DOE and NIH is shown in a table that I would like to insert in the record. The construction item in the DOE program is the Human Genome Laboratory at the Lawrence Berkeley Laboratory. The information follows:

HUMAN GENOME FUNDING
(B/A in Millions)

	FY 1994	FY 1995	FY 1996
Department of Energy			
Operating	$ 61.2	$ 69.2	$ 70.0
Capital Equipment	2.1	2.7	2.8
Construction	2.1	15.8	5.7
Total DOE	65.4	87.7	78.5
National Institutes of Health			
Extramural	107.6	112.5	126.4
Intramural	19.4	40.4	41.0
Total NIH	127.0	152.9	67.4
Total NIH and DOE	$ 192.4	$ 240.6	$ 245.9

Mr. Myers. Several private companies are involved in mapping the human genome. How do DOE and NIH efforts differ from private sector companies?

Dr. Krebs. Genome-related work conducted in the private sector is focused on generating information that in the shorter term might generate profit-making products. Thus, it is focused on sequencing of specific genes, on determining their function and on development of diagnostic reagents or development of drugs or other modifiers of gene action. There is no private sector effort to develop genome wide maps or to sequence the entire human genome which are the goals of the human genome project. The technologies and information stemming from the genome program have clearly stimulated considerable private investment in applications of such information.

Mr. Myers. Is the Environmental Molecular Sciences Laboratory on schedule and within budget?

Dr. Krebs. Yes, the Environmental Molecular Sciences Laboratory is on schedule and within budget, with anticipated project completion during the fourth quarter, 1997.

Mr. Myers. What is the status of the Biomedical Tracer Facility?

Dr. Krebs. For more than two decades, the Department has supported radioisotope production at the Los Alamos Meson Physics Facility and at the Brookhaven Linac Isotope Producer. Budget constraints at each facility have resulted in the lack of a continuous supply of radioisotopes. Congress and the nuclear medicine community have expressed interest in the construction of a National Biomedical Tracer Facility to alleviate the supply problem. The Department requested the Institute of Medicine to conduct an independent evaluation of the need for a National Biomedical Tracer Facility in light of existing large proton accelerator isotope production facilities, and in light of other needs within nuclear medicine. The report endorsed the establishment of a National Biomedical Tracer Facility and included the National Laboratories in their recommendations.

In FY 1994, Congress directed the Department of Energy to spend $2,000,000 to fund studies aimed at determining the feasibility of constructing a National Biomedical Tracer Facility in the private sector. These studies, which have been completed and were submitted to the Department on February 15, 1995, will be evaluated by a review panel of experts on March 27-28, 1995. The Department will consider the reviewers' recommendations and, based on costs and other issues, will decide whether to proceed with plans to build the National Biomedical Tracer Facility in the private sector or to develop plans at a National Laboratory to meet the needs of the radioisotope user community.

As an interim step to address the shortage of large proton accelerator-produced radioisotopes, the Department has funded the upgrade of the Brookhaven Linac Isotope Producer Facility. This upgrade will be completed in 1996.

TECHNOLOGY TRANSFER

Mr. Myers. How many CRADAs will be supported by the fiscal year 1996 budget request?

Dr. Krebs. The fiscal year 1996 Energy Research budget will support the commitments to 108 existing multi-year CRADAs.

Mr. Myers. How does this compare to the fiscal year 1994 level?

Dr. Krebs. The fiscal year 1994 budget supported commitments to 94 CRADAs.

Mr. Myers. What is the break down of planned CRADAs for fiscal year 1996 for major partnerships with industry and for those partnerships with small business?

Dr. Krebs. The program will support three major partnerships: the AMTEX partnership with the textile industry; the Partnership for New Generation Vehicles with the automotive industry; and the Advanced Computational Technology Initiative with the Oil and Gas industry. The AMTEX partnership will have 8 Major projects implemented by an estimated 30 CRADAs in fiscal year 1996. The Partnership for New Generation Vehicles will initiate an estimated 20 CRADAs in fiscal year 1996. The Advanced Computational Technology Initiative will support 8 CRADAs in fiscal year 1996. The program will support an estimated 250 projects with small business in fiscal year 1996. The major partnerships and small business activities plus the ongoing 102 multi-year CRADAs comprise the total program activity in fiscal year 1996.

Mr. Myers. Has this changed since fiscal year 1994?

Dr. Krebs. The fiscal year 1994 budget supported only one major partnership (AMTEX) and 90 projects with small business.

Those projects plus 81 multi-year CRADAs comprised the total program activity in 1994.

Mr. Myers. The Department is proposing a major initiative starting in fiscal year 1996, the Partnership for a New Generation of Vehicles (PNGV). Could you briefly describe this initiative?

Dr. Krebs. The Partnership for New Generation of Vehicles (PNGV) is a partnership between the U.S. government and the U.S. Council for Automotive Research (USCAR) which represents Chrysler, Ford and General Motors. It's objective is to strengthen U.S. competitiveness by developing technologies for a new generation of vehicles. It has three major goals: (1) Improve the productivity of the U.S. manufacturing base by significantly upgrading U.S. manufacturing technology, including the adoption of agile, flexible manufacturing and the reduction of cost and lead times, while reducing the environmental impact and improving quality; (2) pursue advances in vehicles that can lead to improvements in the fuel efficiency and emissions of standard vehicle designs, while pursuing advances to maintain or improve safety performance; and (3) achieve automobile fuel efficiency improvements up to three times that of present vehicles.

PARTNERSHIP FOR A NEW GENERATION OF VEHICLES

Mr. Myers. What is the anticipated DOE contribution in fiscal year 1996 and the total project cost?

Dr. Krebs. The fiscal year 1996 Department of Energy budget includes a total of $250.1 million for the Partnership For A New Generation Of Vehicles (PNGV). It is anticipated that the total cost of the project will be about $10 billion, split evenly over the life of the project, between the Government and industrial partners.

Mr. Myers. Are other DOE programs providing funding? If so, how much?

Dr. Krebs. The Partnership For A New Generation Of Vehicles is supported by three Department of Energy programs. Funding for the partnership consists of focused R&D which is incremental funding for the initiative, and contributing R&D which is that originally intended for other purposes. I would like to provide a table for the record showing this breakout for FY 1996. The information follows:

PARTNERSHIP FOR A NEW GENERATION OF VEHICLES
(in Millions of Dollars)

	FY 1996 Budget Authority		
	Focused R&D	Contr. R&D	Total
Assistant Secretary for Energy Efficiency and Renewable Energy	$166.7	$ 10.1	$176.8
Assistant Secretary for Defense Programs		50.6	50.6
Director, Office of Energy Research	18.0	4.7	22.7
TOTAL	$184.7	$ 65.4	$250.1

Mr. Myers. What benefits will be received by the Department in its participation in the PNGV partnership?

Dr. Krebs. DOE will benefit from participation in the PNGV partnership as many of the projects directly support the defense, energy, environment and science missions of the

Department. Participation in PNGV will also benefit DOE by enhancing the core competencies of the DOE laboratories which are necessary to meet DOE's primary mission objectives. These core competencies will be strengthened while the competitiveness of the domestic automobile manufacturers is enhanced by participation in cost shared industry-laboratory collaborative projects. Knowledge and technology flow will be to and from the laboratories as a result of the collaborative projects.

Mr. Myers. Which of Energy Research's core competencies will be utilized in the partnership?

Dr. Krebs. The Energy Research core competencies in basic research related to combustion, light weight materials, energy storage and conversion, and catalysis will be utilized in the partnership. Laboratory core competencies in research applications related to materials processing, sensor design and application, adaptive and intelligent controls, neural networks for process control, and environmentally sustainable manufacturing will be utilized.

FACILITY OPERATIONS

Mr. Myers. For basic energy sciences, high energy physics and nuclear physics, please provide the projected level of operation at each facility with the proposed fiscal year 1996 funding level. Compare this to the level of operations in fiscal years 1994 and 1995.

Dr. Krebs. Following is the information requested on facility operations:

	FY 1996 Request (B/A)	Operating Hours		
	$000	FY 1994	FY 1995	FY 1996
Basic Energy Sciences				
Stanford Synchrotron Radiation Lab	$ 21,834	4,032	4,032	6,500
Advanced Light Source	38,090	0	3,020	5,253
Advanced Photon Source	94,604	0	0	0
National Synchrotron Light Source (VUV)	34,816	5,400	5,400	5,685
National Synchrotron Light Source (X-Ray)	0	5,100	5,100	5,338
Combustion Research Facility, Phase I	5,797	4,200	4,200	4,368
Intense Pulsed Neutron Source	12,335	2,184	2,184	5,225
High Flux Beam Reactor	30,808	3,600	3,600	6,091
High Flux Isotope Reactor	33,010	4,032	4,179	6,384
Los Alamos Neutron Scattering Center	7,970	N/A	N/A	1,000
Center for Microanalysis of Materials	2,029	0	0	0
Electron Microscopy Center	2,509	0	0	0
Materials Preparation Center	1,080	0	0	0
National Center for Electron Microscopy	3,647	0	0	0
EN Tandem Accelerator	275	0	0	0
Shared Research Equipment Program (ORISE)	200	0	0	0
Shared Research Equipment Program (ORNL)	2,203	0	0	0
National Supercomputer Center	24,958	8,760	8,760	8,760
Total, Basic Energy Sciences	316,165	37,308	40,475	54,604
High Energy Physics				
Fermilab	212,235	4,165	3,936	4,400
Stanford Linear Accelerator Center	126,460	6,200	4,200	5,925
Alternate Gradient Synchrotron	69,985	1,750	1,680	2,200
Total, High Energy Physics	408,680	12,115	9,816	12,525

	FY 1996 Request (B/A) $000	Operating Hours FY 1994	FY 1995	FY 1996
Nuclear Physics				
Tandem/Alternating Gradient Synchrotron	24,400	600	500	1,200
Continuous Electron Beam Accelerator Facility	74,860	0	2,500	5,000
Radioactive Ion Beam	13,025	0	500	3,100
Massachusetts Institute of Technology-Bates	15,800	1,000	2,000	3,000
88 Inch Cyclotron	10,350	5,300	4,700	5,360
Argonne Tandem-Linac Accelerator System	12,500	4,600	4,300	5,000
Los Alamos Meson Physics Facility	2,775	1,400	2,200	0
Total, Nuclear Physics	153,710	12,900	16,700	22,660
Grand Total	$878,555	62,323	66,991	89,789

FUSION ENERGY

Mr. Myers. What is the status of the review of the fusion energy program by the President's Commission of Advisors on Science and Technology (PCAST) and the Office of Science and Technology Policy?

Dr. Krebs. Professor John P. Holdren has been chosen to Chair a panel to conduct this review. The Charge to the reviewers has been developed. The remaining panel members are being selected by the Office of Science and Technology Policy and their schedule for meeting will be developed to support the delivery of their final recommendations in early summer.

Mr. Myers. The cornerstone of the Department's fusion energy program will be the collaboration on the International Thermonuclear Experimental Reactor (ITER) and the Tokamak Physics Experiment (TPX). Could you elaborate on the relationship of TPX and ITER?

Dr. Krebs. The International Thermonuclear Experimental Reactor (ITER) is designed to achieve controlled ignition and extended burning of a deuterium-tritium plasma, with steady-state operation as the ultimate goal, and to demonstrate the technologies required for a fusion power plant. Domestically the U.S. is also pursuing a complementary advanced physics facility. The goal of the Tokamak Physics Experiment (TPX) is to demonstrate, for the first time, the techniques required for steady-state operation of a tokamak and explore the advanced operating regimes required for an economical power plant. Basically, ITER's mission is to demonstrate the scientific and technological feasibility of fusion power, while TPX's mission is to improve the attractiveness of a future tokamak demonstration power plant.

Mr. Myers. Is TPX essential to the development of ITER?

Dr. Krebs. The International Thermonuclear Experimental Reactor (ITER) design is intentionally conservative and does not rely on advances from any future experimental devices. The Tokamak Physics Experiment (TPX) is not essential to ITER, but could make significant contributions to the ITER operating program. As stated in the previous answer, the ultimate goal of ITER is steady-state operation. The TPX will pioneer the technologies and techniques required for steady-state operation in a medium-size, moderate-cost tokamak and will certainly help ITER achieve its ultimate goal more quickly. Moreover, TPX is essential to the intellectual vitality of the U.S. fusion program. The TPX will be the major domestic focus of the U.S. fusion program during the next decade and will also provide U.S. industry with valuable experience prior to beginning ITER construction.

Mr. Myers. If budgets remain at the current level for fusion is it possible to fund both TPX and remain a full partner in ITER?

Dr. Krebs. The current Tokamak Physics Experiment (TPX) project plan calls for a significant budget increase in FY 1997. The current level of resources for the International Thermonuclear Experimental Reactor (ITER) Engineering Design Activity contribution is planned to remain approximately level through the end of the Activity in July 1998. Therefore, in order to fund both TPX and a full partnership in the current ITER efforts at the current budget level, then either some other vital fusion activities must be curtailed or the TPX project stretched out.

For the period beyond July 1998, construction and eventual operation of TPX would continue to require a significant level of resources above today's level and full participation in any ITER construction would itself require approximately a doubling of the current fusion budget. Therefore, even with a stretchout of the TPX project, it would not be possible to fund both TPX and full partnership in ITER construction within the current budget level. A much more modest level of participation in ITER construction would be a necessary condition, as well as a stretchout of TPX, if the current budget level were to cover participation in construction of both TPX and ITER.

Mr. Myers. Please provide the status of ITER activities.

Dr. Krebs. As the 6-year Engineering Design Activities phase is nearing its mid-point in July 1995, almost 75 percent of the design plus research and development tasks have either been completed or identified and assigned to the 4 ITER Parties for completion in 1995 and beyond.

The Joint Central Team is currently preparing an Interim Design Report, which will also include cost and schedule estimates for ITER construction as well as interim site requirements. The report is due in June 1995 and will be reviewed thoroughly by the 4 ITER Parties. The report could strongly influence the ITER Parties' views on whether and how to continue with planning for construction.

The new International Thermonuclear Experimental Reactor (ITER) Director, Dr. Robert Aymar from the European Union (France), and his Administrative Officer, Dr. Robert Iotti from the U.S. (Raytheon-Ebasco), are in place and improving the efficiency and effectiveness of the international Joint Central Team.

Mr. Myers. How much funding is included in fiscal years 1994, 1995 and 1996 for U.S. participation?

Dr. Krebs. The following table provides the requested information.

ITER Funding
(B/A in millions)

FY 1994	FY 1995	FY 1996
$62.7	$70.6	$82.0

Mr. Myers. How much has been contributed by each foreign country for those years?

Dr. Krebs. The European Union and Japan have provided about the same level of effort as the U.S. has. The Russian Federation has been falling somewhat behind, due to their economic problems; however, the work they do is of high quality, and their participation is making significant contributions.

Mr. Myers. You have indicated that an Interim Design Report will be issued this June which will provide a detailed cost and schedule for ITER. What will happen to the U.S. fusion program if the international community decides not to proceed with the construction of ITER?

Dr. Krebs. The common view among the major fusion programs is that a device like the International Thermonuclear Experimental Reactor (ITER) is required to continue progress in fusion energy development. If for whatever reason the international community is unable to reach an agreement to proceed with ITER construction and operation, the U.S. fusion program would need to explore other options. A clear decision by the international community on this issue is not likely to be made for several years. The issue of what direction the fusion program should take will be part of the President's Committee of Advisors on Science and Technology review of the fusion program that is scheduled to be completed in early summer.

Mr. Myers. When would you expect a decision would be made to proceed with the construction phase of ITER?

Dr. Krebs. The four Parties' supervisory body, the International Thermonuclear Experimental Reactor (ITER) Council, is planning to meet next at the end of July 1995 and later in mid-December 1995. The Council's staff is now working on possible approaches to the decision-making process. The Council may be able to make recommendations to the ITER Parties at either the July or December meetings on such a decision-making process. This timing compares well with the schedule for the President's Committee of Advisors on Science and Technology in which the U.S. would receive important advice this summer on fusion program issues, particularly on the matter of participation in any ITER construction. In any case, decisions by the end of the current Agreement, which continues through July 21, 1998, would allow a smooth transition into any construction activities.

Mr. Myers. Can you comment on the recent Office of Technology Assessment report on the fusion energy program?

Dr. Krebs. We have looked at the findings in the report. Here are our comments.

Finding:

"The role of the fusion energy program in meeting long-term energy needs and the level of research effort justified by that potential role are critical issues for the program."

DOE Comment:

Development of fusion energy requires and deserves a sustained commitment at the national level, and should be a high priority given the limited number of future energy options and the enormous role energy plays in the world economy. It is entirely appropriate for the government to undertake such a long-term effort.

Finding:

"Much progress has been made in fusion energy research over the past few years, but far more remains to be done."

DOE Comment:

Much progress has been achieved in fusion energy research despite past budgets which have fallen far short of plans. In fact, the power output seen in tokamak experiments has improved by a factor of ten million over the past 25 years. It is true that substantial scientific and engineering challenges still lie ahead. Annual budgets would have to increase by a factor of two or more to attain the present fusion program milestones.

Finding:

"Despite congressional requirements in the Energy Policy Act of 1992, as of December 1994, DOE has not issued a strategic management plan for the fusion energy program by which the program's progress can be judged."

DOE Comment:

The Department is in the final stages of preparing a strategic management plan for fusion energy. Progress has been hindered by the rapidly changing budget environment.

Finding:

"Without substantial funding increases, the [fusion] program will have to change significantly from the current direction and new goals will have to be set."

DOE Comment:

Without substantial funding increases, the fusion program cannot move onward with full-scale energy development efforts envisioned in the Energy Policy Act. The program would continue to be focused on the scientific investigation of fusion energy issues to improve the prospects for future fusion power plants.

The Federal Government is the appropriate and the only source of funds for fusion development. Although the requirement is larger than the current level, it is small in the context of the country's energy infrastructure, or annual expenditure for energy, or the ultimate potential of fusion.

Finding:

"TPX is not scheduled to provide any unique scientific and technological advances essential to ITER."

DOE Comment:

The ITER design is intentionally conservative, such that it does not heavily rely on advances from any future experiments, and its schedule has always been independent of that for TPX. ITER would obviously make maximum use of TPX results as they became available.

TPX is aimed at (1) improving the performance and economic attractiveness of a tokamak power plant and (2) developing the technology needed for continuous operation of a fusion power plant. TPX complements ITER. Both are needed to design a cost effective demonstration power plant. However, TPX will provide valuable information on long pulse operation to ITER and possibly develop techniques for improved operation that can be tested in ITER. TPX will involve U.S. industries in the fusion program in a substantial way and will help prepare industry for participation in ITER.

Finding:

"No other partner in the ITER project has found it essential to pursue a device with TPX's capabilities as part of the program for successful development of ITER."

DOE Comment:

While not essential to ITER, it is an essential element in the development path of fusion. It will provide a replacement for the TFTR and will build on the recent successes of TFTR. Both Europe and Japan are continuing to make substantial investments in additional domestic fusion research facilities of a similar scale to TPX but which have different and complementary missions.

Finding:

"While the potential benefits of TPX to ITER can be real, their magnitude is uncertain, and DOE has not estimated their value. Further, there are no plans to account for the benefits of TPX to ITER as part of the direct contribution to the U.S. commitment to ITER."

DOE Comment:

As already mentioned, the primary TPX mission is a better demonstration plant, not support of ITER. DOE has also identified potential benefits to ITER from TPX. It is not possible to estimate their value until the design of ITER is further along. Each party's direct contribution to ITER is quantified and measured according to the terms of the EDA agreement. Their domestic research programs, which for the U.S. would include TPX, are implicitly assumed to be providing supporting R&D to ITER.

Finding:

"Unless tested in ITER, there will likely be considerable uncertainty of the transferability of TPX results to DEMO."

DOE Comment:

We agree that the results from TPX would need to be tested in ITER in order to make use of them in the construction of a Demo Power Plant. Without TPX however, such experiments may never be conducted because of the size and scale of ITER operations.

Finding:

"The value of TPX to the magnetic fusion energy program could increase if ITER is delayed."

DOE Comment:

Delaying ITER by several years in order to incorporate the results of TPX has not been discussed with our ITER partners. If the U.S. were to propose such a delay, the future of a construction collaboration could be seriously jeopardized. In addition, the delay necessary to fully make use of TPX results and redesign ITER would set back the timetable for fusion development by at least a decade.

Finding:

"Regardless of decisions on TPX, the overall tokamak fusion energy effort will require justifying a series of expensive research activities, of which the U.S. contribution to ITER presents the largest single budgetary requirement in the near future."

DOE Comment:

Yes, nearly a decade ago, world fusion program leaders recognized that budget limitations in the U.S. and elsewhere would make it difficult to continue a fusion energy development program unless the costs were shared. Their vision of an international engineering test reactor has progressed to the engineering design stage - the ITER Engineering Design Activities.

Finding:

"Over the past few years, the fusion energy program was substantially narrowed to focus on the tokamak primarily for budgetary rather than technical reasons."

DOE Comment:

Budgetary restrictions contributed substantially to the narrowing of the focus of the fusion energy program in the 1990 time frame. However, a change of program emphasis, based on a recommendation of the Fusion Policy Advisory Committee, to advance to a goal-oriented energy program was also a major factor. The selection of the tokamak was primarily based on the physics performance of the tokamak approach relative to others that had been or were being investigated.

Finding:

"There is a widely held view that the narrowing of the fusion energy program was premature and did not reflect the benefits of pursuing alternate concepts."

DOE Comment:

Alternates concepts are not at the stage of development where increases in the scale of the devices is warranted [see comment above]. However, the fusion energy program does maintain a modest alternate concept effort in which the emphasis is on the basic physics of the concepts. This should set the stage for expanding the effort on alternates if the progress is warranted.

Finding:

". . . promising alternative concepts, including novel ones, may provide a fusion energy option should the tokamak prove technically infeasible or commercial unattractive."

DOE Comment:

The basic technical feasibility of the tokamak approach for fusion energy production is not in doubt. What remains to be established is the commercial attractiveness of the tokamak approach. It is for this reason that alternates may eventually play a role in fusion energy development.

Finding:

"DOE suggests that a healthy, but constrained' alternate concepts program would require about a $100 million per year."

DOE Comment:

The level of development of alternate concepts varies significantly as noted in the OTA report (p. 72). A healthy program would require support of concepts at several stages of development, and would require facilities construction, as justified by concept advances.

Finding:

"However, a substantial amount of information that provides a firmer basis for making future alternate concept decisions could be developed with a far more modest program."

DOE Comment:

The Department presently conducts a far more modest program in alternate concept development. Such a program can always be made less expensive by eliminating some of the concepts and reducing the level of information and results sought from the remaining concepts under development.

During a twenty year period of aggressive development of alternate concepts, the Department evaluated most of the fusion concepts listed in the OTA report (Table 4-1), and the unsupported novel possibilities were much less attractive than the alternate concepts that had been reviewed and were under development in 1990.

Finding:

"However, proponents suggest a development path for the heavy ion driver IFE concept that could be substantially more flexible and less costly than that planned for the tokamak development effort."

DOE Comment:

We endorse the OTA report's comments concerning the technical uncertainty associated with IFE, and development program cost uncertainties as well.

Finding:

"In summary, while alternate concepts provide no panacea for fusion energy development, there is merit in examining them as part of a broad fusion program."

DOE Comment:

These issues effecting the balance of the effort in the fusion program are characteristic of development programs. In 1990, the Fusion Policy Advisory Committee recommended undertaking an applied energy development program. Their recommendations did include programs of alternate concepts as well as a broad program of IFE driver development. However, budget stringencies required a setting of priorities among the program elements, and the present levels of effort in the several program elements have been the outcome.

Mr. Myers. Utility groups have expressed concern that the tokamak in its present form raises economic concerns for future energy production because of high capital costs among other things. What areas of the tokamak development program have the potential to reduce the ultimate cost of a tokamak power plant?

Dr. Krebs. The Tokamak Physics Experiment (TPX) is the main element of the U.S. tokamak program aimed at reducing the size and cost of a tokamak fusion power plant. Its goal is to demonstrate both the technologies required for continuous operation of a tokamak and the advanced operating methods that will lead to a smaller, less costly tokamak reactor. Fusion systems studies indicate that if TPX is successful, the cost of electricity from a fusion power plant could be 20-40 percent less than that projected from current tokamaks.

Mr. Myers. How does the U.S. strategy for fusion compare to the strategies of the domestic programs of other countries?

Dr. Krebs. The basic strategies of the four major fusion programs are very much the same, with differences of emphasis consistent with the strengths and budgets of each program. The programs of the European Union, Japan, Russia and the United States all focus on the tokamak physics program and envision the International Thermonuclear Experimental Reactor as the next step experiment, followed by a demonstration power plant to produce electrical power. Each also is pursuing the possibility of an international, high flux materials testing facility.

In the European Union, this basic strategy is complemented by a significant program in supporting technologies and a strong program in alternate concepts, including both the stellarator and reversed field pinch and an awareness of inertial fusion.

In Japan, this basic strategy is complemented by a significant program in technology development and strong support for industry. Japan also maintains a major program in alternate concepts, focused on the Large Helical Device and including a continuing program in inertial fusion.

In Russia, this basic strategy is the focus of the program with complementary elements in technology and alternate concepts severely limited because of the overall financial limitations in science and technology.

In the United States, this basic strategy is complemented by an active program of concept improvement centered on the Tokamak Physics Experiment, very modest programs in supporting technologies and development of innovative concepts, including inertial fusion energy. The U.S. program is constrained and more focussed because of funding limitations relative to the European Union and Japan.

Mr. Myers. What is the dollar comparison?

Dr. Krebs. We have information that describes the level of activity in fusion energy research and development in the U.S., European Union, Japan and Russia. Because each of our systems is different, there is no simple analysis that conveys a true comparison. To answer the question, we have taken the available information and made assumptions to develop an approximate comparison of effort. For the European Union, which budgets for the entire fusion effort through its Commission and the Member States, we have used the recent currency exchange rate to arrive at a dollar figure. For Japan, which budgets separately for technical personnel and other fusion activities, we have taken the currency exchange rate applicable to last year and also assigned the average U.S. cost for the personnel involved. For Russia, we have judged that the scale of the program in recent years was comparable in effort to the U.S. and used the current information from Russia that science, generally, and fusion in particular, is receiving about half the planned level.

With these assumptions, the relative dollar figures are the following for Calendar Year 1994 which is an average of the most recent numbers available:

United States	$322M
European Community	$580M using 1ECU=$1.29
Japan	$460M using 100Y=$1
Russian Federation	$161M using 1/2 U.S. program

Mr. Myers. What is the total estimated cost of the fusion energy program which would result in a demonstration power plant by the year 2025 and a commercial power plant by about 2040?

Dr. Krebs. With industry contributing to the cost of constructing a demonstration power plant by the year 2025 and continued extensive international collaboration, we would estimate the total cost of the fusion Program to the Department to be in the range of a few tens of billions of dollars. We would expect industry to accept the full burden for construction of a commercial power plant by the year 2040, with no cost to the Department.

Two consequential points should be noted. First, the cost of importing oil to the U.S., at the current price of $16 per barrel, is on the order of $120,000,000 a day, or about 1/3 the fusion budget for an entire year. Second, it must be remembered that the investment in fusion is an investment in the future energy security of this nation.

Mr. Myers. How much would the annual budget for fusion need to be increased to reach this goal?

Dr. Krebs. In order to reach the goal of a demonstration power plant by the year 2025, the annual fusion budget would need to increase by about a factor of 2 from the current FY 1995 level of $365,000,000 plus some increment for our share of the International Thermonuclear Experimental Reactor (ITER) construction. This ITER increment would depend on what role the U.S. wished to play in ITER, from modest to major, and on what cost-sharing arrangements we could negotiate. We would expect industry to accept the full burden for construction of a commercial power plant by the year 2040, with no cost to the Department.

Mr. Myers. Of the total fiscal year 1996 fusion budget, how much will go to the universities?

Dr. Krebs. Of the total fiscal year 1996 fusion budget $74,100,000 will go to universities.

Mr. Myers. How much will go to the U.S. industry?

Dr. Krebs. Of the total fiscal year 1996 fusion budget $86,000,000 will go to industry.

Mr. Myers. How does this compare to fiscal years 1994 and 1995?

Dr. Krebs. This compares to fiscal years 1994 and 1995 as follows:

	(B/A in Millions)		
	1994	1995	1996
Universities	$ 72.1	$ 76.9	$ 74.1
Industry	50.8	71.1	86.0

Mr. Myers. The Tokamak Fusion Test Reactor (TFTR) will cease operations in FY 1996 and preparations to remove the tokamak will be started. Will any of the TFTR facilities be transferred to the TPX?

Dr. Krebs. The plan is to construct the Tokamak Physics Experiment (TPX) in the same test cell where the Tokamak Fusion Test Reactor (TFTR) is now located. The TPX will make extensive use of much of the existing TFTR equipment, such as power supplies, neutral beam and radio wave heating systems, diagnostic instruments, and water cooling systems. The estimated replacement value of all of the test cell and auxiliary systems is about $150,000,000.

Mr. Myers. Energy Research has several large construction projects either just started or proposed to begin in FY 1996. With severely constrained budgets on the horizon for the Department, where would the fusion program initiatives fit in with the Department's priorities?

Dr. Krebs. Within the fusion program the two FY 1996 construction initiatives, the Tokamak Physics Experiment and the Elise, have high priority. The President's Committee of Advisors on Science and Technology will review the fusion program including the International Thermonuclear Experimental Reactor and make recommendations to the Department on the program's priorities. The results of this review are expected in the early summer.

FUSION ENERGY

Mr. Myers. Please discuss the inertial fusion energy program.

Dr. Krebs. The current inertial fusion energy program primarily supports research leading to the development of an efficient, reliable, high repetition rate driver. Heavy ion induction accelerators have been recommended by the Fusion Policy Advisory Committee as the most promising drivers for inertial fusion energy. This recommendation was reaffirmed by the Fusion Energy Advisory Committee in 1993. Pursuant to these recommendations and in response to the National Energy Policy Act of 1992, start of construction in FY 1996 of Elise has been proposed. Elise would be an induction linear accelerator capable of delivering multiple, driver-scale ion beams. Activities are to be paced to correspond to progress in laser-driven ignition of inertial confinement fusion targets at the Defense Programs National Ignition Facility, also planned for start of construction in FY 1996.

Mr. Myers. Why is funding reduced in fiscal year 1996?

Dr. Krebs. Research and Development Associated with Construction (RDAC) funding for the Elise project was decreased from $3,000,000 in 1995 to $350,000 in 1996 as this work was completed. The $350,000 RDAC funding is specifically associated with preparations for the Elise project, and is appropriate to support the start of construction. The RDAC funding is used to prepare for the start of a construction project. Since the Department has requested funding to begin construction of Elise in FY 1996 the reduction is appropriate and does not represent a reduction in effort on the Elise project.

Mr. Myers. How will the proposed linear heavy ion induction accelerator contribute to the program goals?

Dr. Krebs. The Elise is the first stage in a heavy ion induction accelerator. If the results from Elise experiments are successful, the Department will then consider whether or not to proceed with the construction of the remaining portion of the proposed accelerator system and ensuing beam experiments. Elise will address some critical physics issues associated with heavy ion induction accelerators which must be resolved before proceeding to further development of the concept.

Mr. Myers. How is the inertial fusion energy program in the Office of Energy Research coordinated with the inertial confinement fusion program in the Office of Defense Programs?

Dr. Krebs. The two programs are different but complementary which allows the ER program to leverage its smaller dollars with those of the Defense Program efforts. The inertial fusion energy program in the Office of Fusion Energy is primarily directed toward the development of heavy ion accelerators which have been identified by several reviews as the optimum driver for inertial fusion energy production. The inertial confinement fusion effort in the Office of Defense Programs has program elements using both light ion and laser drivers. The inertial confinement fusion program is responsible for developing inertial confinement fusion targets which will provide information of relevance for targets suitable for inertial fusion energy applications.

Our primary heavy ion accelerator research activity is at Lawrence Berkeley Laboratory, in collaboration with Lawrence Livermore National Laboratory. The proposed low cost accelerator called Elise would provide an experimental platform for critical experiments to provide information to aid in decisions about proceeding with the induction linac approach. The pace of this work is consistent with the anticipated pace of target development in the Defense Programs activity which now includes plans for the construction of the National Ignition Facility.

Mr. Myers. Are there similar technical problems?

Dr. Krebs. The laser drivers are distinct from the ion concepts and are being addressed separately by Defense Programs. However, there are beam transport physics issues common to light and heavy ions in a reactor chamber. The element central to all is the target, and target physics issues are addressed in the inertial confinement fusion program.

Mr. Myers. Please provide the fiscal year 1994, 1995, and 1996 funding for the fusion program at the subprogram level of detail.

Dr. Krebs. The budget by subprogram for the Fusion Energy program is as follows:

	(B/A in Thousands)		
	FY 1994	FY 1995	FY 1996
Confinement Systems			
Operating Expense	$ 163,156	$ 187,857	$ 131,492
Capital Equipment	10,623	5,300	8,000
Construction	0	0	49,900
Subtotal	173,779	193,157	189,392
Applied Plasma Physics			
Operating Expenses	57,250	54,275	48,821
Capital Equipment	460	325	179
Subtotal	57,710	54,600	49,000
Development and Technology			
Operating Expenses	77,950	89,026	100,400
Capital Equipment	4,050	3,974	3,600
Subtotal	82,000	93,000	104,000
Planning and Projects			
Operating Expenses	38	7,364	6,053
Construction	1,924	2,000	2,000
Subtotal	1,962	9,364	8,053
Inertial Fusion Energy			
Operating Expenses	3,859	8,000	3,100
Capital Equipment	386	700	700
Construction	0	0	3 ,200
Subtotal	4,245	8,700	7,000
Program Direction	8,926	9,600	9,600
Total	$ 322,277	$ 366,356	$ 366,045

TECHNOLOGY TRANSFER

Mr. Myers. In addition to the budget request of $3.1 million for your office to oversee the Department's technology transfer program, the budget request for technology transfer programs for fiscal year 1996 includes $225 million for the nuclear weapons laboratories and $58.3 million for energy research laboratories.

Mr. MacLachlan, the Galvin report had several observations on the Department's technology transfer program. One was that there are relatively few instances where laboratories have technology that is vital to industry and that is uniquely available at the laboratories. Also, many firms collaborate with the laboratories because of the availability of cost-sharing funds which subsidize the resource commitments that the firms would have made anyway. Can you respond to these concerns?

Dr. MacLachlan. In general, industry is attracted to the laboratories less for their technology and more for their leading edge capabilities in a wide range of areas that are relevant to industry's needs. As the Galvin report notes, areas blanketed by the laboratories science spectrum include:

> "the world's most intense X-ray sources, biomedical isotopes; chlorofluorocarbon substitutes; computer models of combustion for cleaner energy; laser isotope separation; lasers for pollution monitoring; neutron sources to probe materials and biological systems; the unraveling of the puzzles of the human genetic code; the harnessing of the wind, sun and earth for renewable energy; superconductivity; global ocean and atmospheric studies; detection and tracking of nuclear materials; fossil, fission, fusion energy; novel semiconductor materials and devices; laser destruction of blood clots; bioremediation of radioactive and hazardous waste; accelerator technology for medical applications; and remediation of radioactive tanks. These are but a few examples."

There are many indications that industry values these capabilities. Since 1990 when the DOE laboratories began to do CRADAs, industrial partners have entered into over 1200 CRADAs and have committed over $1.2 billion to these CRADA. Many companies are repeat customers. Another indicator of value is the number of R&D 100 Awards, the awards for innovation put out by *Research and Development* magazine, that the DOE laboratories have received. DOE laboratories, which conduct about 4 percent of the nations R&D, have received 11 percent of the 3163 R&D 100 awards since 1963, more than any other private or public recipient and more than all other Federal agencies and universities combined.

Regarding the second part of the question, companies enter into CRADAs to accomplish their goals more efficiently and effectively than they can on their own. Laboratories enter into CRADAs for the same reasons. In most cases companies use CRADAs to do work that they can not support by themselves. Companies generally prefer to go it alone if they can, because they then obtain all the intellectual property rights and do not have to spend time negotiating and managing a partnership. Companies tend to choose partnerships when the company lacks the resources, the expertise, or the equipment for a project.

There is no way to assure that companies would not perform the same work on their own in the absence of a CRADA. However, that should not be the issue. If the Department enters into a partnership that supports its missions (i.e. by sharing the cost or knowledge to develop needed technologies) and the partner also saves money or time that it would have spent anyway, it is clearly a desirable partnership that benefits both the Department and the economy. The same situation exists when two private companies choose to cooperate in R&D -- they may or may not have been able to do the work on their own, but it is more efficient for them to do the work in a partnership. Neither partner subsidizes the other, but both sides benefit.

These kinds of partnerships are increasingly important and common as technology becomes more complex and fast moving. No company or laboratory can afford to be on the cutting edge of all the areas of technology that are needed for its business or missions, and partnerships are a effective way to reduce the cost of exploring and developing new technologies.

Mr. Myers. The Galvin report also noted that the industrial competitiveness activities at the national laboratories are unfocused and lack a firm policy foundation. How will you address this concern?

Dr. MacLachlan. The Galvin report noted that "DOE headquarters have recognized the need for greater focus in this area and are developing criteria toward that end. We welcome these developments and encourage early discussions of the evolving situation with laboratory leadership." We have developed criteria and have circulated them to the laboratory leadership for comment. These criteria will be issued in final form by March 31, 1995. These criteria will ensure that DOE supported partnerships will support the Department's core missions, will have the potential to yield economic and other national benefits, will have measurement and accountability standards, will be formed in a fair and open manner, and will be formed and managed using best business practices.

Mr. Myers. How can we be assured that the Government and the taxpayers are receiving an equal benefit from DOE's technology transfer activities?

Dr. MacLachlan. The laboratories are receiving the benefit of over $1.2 billion in partner contributions in CRADAs. This amounts to 58 percent of the total CRADA value of over $2.2 billion. This shares the expertise and cost of developing technologies and capabilities that the laboratories need. Also, the Government receives fully paid-up, worldwide residual use licenses to all intellectual property developed by partners under CRADAs.

In the past, a criterion for CRADA selection has been that CRADAs must confer reasonable mission benefits. We now require that these benefits be specific and quantifiable. In this regard, we have begun to count prototype equipment and software, and proprietary technical data brought in as part of the collaborative work of CRADAs. In addition to CRADAs, there are a number of mechanisms that bring technology and know-how into laboratories. These include visits by outside scientists and engineers (generally short-term) personnel exchanges (generally longer-term) and reimbursable work for others (in which laboratory scientists and engineers hone their skills by working on technical problems presented by outsiders in ways that do not interfere with program missions).

A fundamental concern is quantifying the value of technology transferred from partners and universities. We are in the process of improving this documentation, in terms of costs avoided, and time saved in program mission work, for example. Some of the value of such transfers is difficult to quantify, such as, for example, improved software that increases the confidence in the safety of the nuclear stockpile despite the lack of data from actual testing of nuclear devices. Here are a few examples where there is significant mission value from partnerships:

o The Kansas City Plant increased its knowledge of filled plastic material behavior and processing parameters via a CRADA with ECOMAT, Inc. This knowledge has applications in both weapons and the construction industry.

o The Pacific Northwest Laboratory is improving its near-field optical microscope via a CRADA with a small business. This will greatly increases the precision available to scientists seeking to understand complex chemical and biological systems. The microscope itself will be used at PNL's Environmental Molecular Sciences Laboratory.

o Los Alamos National Laboratory, in a CRADA with Schlumberger Doll Research, is developing new algorithms and a graphical user interface that will improve its ability to do radiation transport calculations. Such calculations play a crucial role in DOE work ranging from nuclear weapons stewardship to radiation health physics. Specific benefits include improved computational physics, better visualization, greater efficiency and a more user-friendly interface in all applications that apply Los Alamos radiation transport codes. Schlumberger Doll upgrades its ability to design safer, more environmentally-friendly, reliable radiation tools for logging oil and gas wells. Logging of oil and gas wells is done to predict the likelihood of a producing well instead of a dry hole.

Mr. Myers. Can you quantify how much actual technology has resulted from these efforts?

Dr. MacLachlan. We will be able to measure and evaluate the benefits of these agreements as they come to fruition. Keep in mind that our Cooperative Research and Development Agreements (CRADAs) are quite new. Over 90 percent of our CRADAs, which are typically three year partnerships, have been started in the last three years. As a result, only ten percent have been completed, with most of these in the last year. During the early years of the program, all we could measure were number of agreements, resources committed, processing time, and customer satisfaction. We are now putting in place a system to measure the technology produced and other benefits. This data will be collected systematically throughout the Department through an on-line system, the Integrated Technology Transfer System, which we expect to be a model for other agencies.

Mr. Myers. How can the Department protect itself from charges of unfair competition if specific tasks are performed on a sole source basis?

Dr. MacLachlan. DOE laboratories and facilities, in their management and operating contracts, agree to practice fairness of opportunity in their technology transfer and technology partnership activities. We reinforce this in our selection criteria for partnerships. This means that information about opportunities for CRADAs must be widely advertised (in the *Commerce Business Daily*, typically). When a prospective partner comes to us with an idea for specific partnership, which may contain confidential information, we are not required to advertise it to others.

Mr. Myers. Congress continues to set aside funding for technology transfer activities. Shouldn't the use of technology collaborations be an integral part of all research and development activities?

Dr. MacLachlan. Yes, the use of technology collaborations should be an integral part of all research and development activities. The "set-aside" funds have been instrumental in expanding technology collaborations and making them a standard way of doing business at the Department. Many of the Department's programs, particularly those in applied R&D, now include technology partnership activities in their programatic budgets.

The set aside funding continues to be useful in managing collaborations that support the Department's mission. They work particularly well with R&D activitities, such as basic research and defense, where industrial collaborations are not the core programatic activity. The set aside funding permits a more rapid and flexible response to a partnership opportunities than would exclusive reliance on base program funding.

Mr. Myers. Why is a special set-aside necessary?

Dr. MacLachlan. For many years the DOE laboratories have been criticized for being too insular and not working well with industry or others. The set-aside funding for CRADAs has been the first approach that significantly increased interaction with industry and has begun to change the culture and break down the isolation of the laboratories. This change is not yet complete or firmly established. We believe that the set-aside funds are an effective way to ensure that labs integrate their work with industry.

The Department of Energy agrees that consideration of mission related technology collaborations should be an integral part of how we manage and conduct our research and development activities. We need to decide at the outset of an effort whether it is in the public interest to pursue the activity solely within the Department's resources (make); obtain the needed support from others (buy) or to leverage our talent, facilities, and other resources with others to reduce risk, manage costs, accelerate performance or for other benefits (collaborate). Collaboration is the hardest alternative, but it may have the greatest benefits. We have used the "set-asides" to both learn better how to collaborate and to drive culture change.

As a management tool, the "set-aside" is useful for several reasons. It allows the laboratories to respond more quickly to mission-supportive opportunities presented by industrial partners than they could with programmatic funds. It provides a high level coordination with other DOE programs, other agencies, and consortia. This enables better coordination, greater leveraging of funding, and better exchange of information among agencies and the private sector, than if the funding were conducted by a single laboratory or program office.

It should also be noted that many of the collaborations using "set-aside" funds are multi-year efforts and elimination, or substantial reduction, would result in terminating a number of merit-selected, mission-related efforts before the full value to the taxpayers have been obtained. This would be costly both in terms of prior use of taxpayer funds as well as in terms of our relationships with our partners if we prove to be unreliable from a business perspective. We believe that the "set-asides" have served and will continue to serve a purpose as one tool in accomplishing the public's research and development objectives. Set-aside funds continue to work particularly well in situations such as basic research programs and the defense area, where the work is more fundamental and hence further removed from potential development for application as a product, process or service by the private sector. We have used this tool in an effective manner and urge that our flexibility in this area be preserved.

Mr. Myers. Please describe the various techniques used by the Department to share the costs of programs with industry. This should include but not be limited to technology transfer programs, cost-shared projects, cooperative research and development agreements, and loan guarantees. Include the amount of funds by program for each funding mechanism.

Dr. MacLachlan. The Department uses a number of mechanisms to work with the private sector. These mechanisms and their definitions are:

(a) "Contract" is generally an acquisition instrument defined in the Federal Acquisition Regulations (FAR) (48 CFR Section 2.101) entered into between the government and contractors for the provision of property or services (to include research, development, demonstration and commercial application programs and activities).

(b) "Cooperative Agreements" are defined in 10 CFR Chapter III Section 600.310 as financial assistance instruments used by the DOE to transfer money or property when the principal purpose of the transaction is accomplishment of a public purpose of support or stimulation authorized by Federal statute and substantial involvement is anticipated between DOE and the recipient during performance of the contemplated activity.

(c) "Cooperative Research and Development Agreements (CRADAs)" are agreements under the auspices of the Stevenson-Wydler Technology Innovation Act of 1980, as amended, (PL 96-480; 15 USC 3701 to 3714) between and among one or more federal laboratories and one or more non-federal party (may include industry, non-profits, universities, state or local governments or agencies thereof, or individuals). The non-federal party may provide funds, personnel, services, facilities, intellectual property, equipment or other resources to conduct specific research and development work consistent with the mission of the laboratory. The laboratory may provide the contributions analogous to the non-federal party, except that there will be no funds provided by the laboratory to the CRADA partner. A CRADA is not a procurement contract or financial assistance agreement as those terms are used in 31 USC 6303, 6304 and 6305.

(d) "Cost-shared Contracts" are defined in the Federal Acquisition Regulations (FAR)(Section 16.303) and are like other contracts, in that they follow the same procurement procedures, but the performer is reimbursed only for an agreed-upon portion of its allowable costs necessary to accomplish the project or effort. Cost-shared contracts can include both cost participation and in-kind contributions by both parties. This type of collaboration must be of mutual benefit to both the DOE and the partner and must meet specific government requirements.

(e) "Environmental Cleanup Technology Transfer Work" is specific to the Environmental Management program and includes mission direct technology brokering, assessing technology for commercialization potential, and movement of successful technologies across departmental sites for application and to the private sector for commercialization.

(f) "Personnel Exchanges" are agreements between a laboratory and a company or university to promote the exchange of technical ideas and information through the unilateral or bilateral assignment of technical personnel. Under personnel exchanges, staff members become part of a research group or organization within the receiving Federal or non-Federal laboratory. It should be noted that cross-assignment of technical staff can also take place under CRADAs.

(g) "Small Business Innovation Research" and "Small Business Technology Transfer Pilot Program" grants are grants made from set-aside funds by the Department to small business. Phase II awards under both programs require the evaluation by DOE of private cost-sharing as part of the overall review process.

(h) "Technical Assistance" is the provision of existing know-how, information or access to unique or specialized equipment to a private party or parties by DOE or one or several of its contractors, under the auspices of the Stevenson-Wydler Technology Innovation Act of 1980, as amended, (PL 96-480; 15 USC 3701 to 3714).

(i) "User Facilities" are specifically designated by DOE at its laboratories for use by outside parties. These are typically advanced, complex and sophisticated scientific equipment or software, which may be unique. These facilities are open for use by universities, industry, non-profits, other Federal laboratories and state and local governments. Work at user facilities may be conducted under proprietary arrangements, in which case full cost recovery (including departmental overhead and depreciation) takes place or non-proprietary arrangements, in which case departmental overhead and depreciation are generally waived under DOE policy. For the purposes of this crosscut, we are collecting operating dollars which can be tied to non-Federal users of user facilities.

(j) "Technology maturation" is an activity which involves additional research and development to facilitate the transfer of a technology. Technology maturation is intended to facilitate the commercialization of new or existing technology by U.S. industry. Technology maturation can also occur as part of a CRADA or other technology transfer arrangement with a recipient.

It is worth noting that some of these mechanisms proceed through laboratories (user facilities, technical assistance, consulting, personnel exchanges, Cooperative Research and Development Agreements) and others (cooperative agreements, contracts) proceed through direct Department interaction with partners.

See the attached cross-cut technology partnership mechanism funding update for data by program and mechanism for fiscal years 1992-1996.

DOE TECHNOLOGY PARTNERSHIP FUNDING UPDATE ($ THOUSAND) March 6, 1995

		FY 1992	FY 1993	FY 1994	FY 1995	FY 1996
ER						
	CRADAs	$11,265	$23,756	$81,097	$61,780	$65,513
	Coops	17,500	21,700	28,700	29,600	34,100
	Contracts	52,600	56,600	77,000	129,600	129,600
	Tech Maturation	417	615			
	User Facility (non-Fed)	66,200	76,500	78,500	95,000	111,000
	Pers Exch	8,705	8,815	13,775	13,278	12,125
	Total	$156,687	$187,986	$279,072	$329,258	$352,338
DP						
	CRADAs	40,000	102,000	168,900	182,100	183,200
	Coops	6,000	11,000	15,100	18,100	16,100
	Tech Maturation		15,000			
	Consulting	1,000	5,000	10,100	11,100	12,000
	Fin Asst Agreements & Grants		8,000	17,400	8,600	20,600
	Total	$47,000	$141,000	$211,500	$219,900	$231,900
EM						
	CRADAs	500	4,000	6,000	5,700	5,700
	Coops	9,000	9,700	12,000	16,900	21,700
	Contracts		30,000	34,900	42,700	41,200
	Env Cleanup TT work	5,000	5,300	5,800	6,400	6,500
	Total	$14,500	$49,000	$58,700	$71,700	$75,100
FE						
	CRADAs	8,562	10,158	11,366	29,300	30,750
	Coops	413,004	41,910	307,127	236,000	256,000
	Contracts	2,917	2,282	31,527		
	Total	$424,483	$54,350	$350,020	$265,300	$286,750
EE						
	CRADAs	20,000	25,000	30,000	45,000	45,000
	Coops	440,000	475,000	520,000	755,000	755,000
	Total	$460 000	$500,000	$550,000	$800,000	$800,000
NE						
	CRADAs	400	400	4,100	4,200	7,600
	Coops	2,000	8,500	27,900	26,100	25,000
	Tech Maturation	1,000	$300	$600	600	600
	Contracts	36,300	40,300	18,800	23,200	16,400
	Total	$39,700	$49,500	$51,400	$54,100	$49,600
SubTotal		$1,142,370	$981,836	$1,500,692	$1,740,258	$1,795,688
SBIR/STTR		42,600	49,500	54,000	73,300	75,000
DEPARTMENTAL TOTAL		$1,184,970	$1,031,336	$1,554,692	$1,813,558	$1,870,688

Mr. Myers. For the record, please provide a table showing by appropriation and program the total amount spent by the Department on technology transfer activities in fiscal years 1993, 1994, 1995 and 1996.

Dr. MacLachlan. With respect to appropriation, all of the Defense Programs technology partnership budget comes from the Atomic Energy Defense Weapons Activity appropriation. With respect to Energy Efficiency and Renewable Energy as well as Nuclear Energy, the technology partnership budgets come from the Energy Supply R&D appropriation. The Environmental Management technology partnership budget comes from the Defense Environmental and Waste Management appropriation. The Fossil Energy technology partnership budget is split between the Fossil Energy R&D appropriation and the Clean Coal appropriation. With respect to Energy Research, two appropriations are involved, Energy Supply R&D and General Science.

In addition, there are several allocations that are not easily assigned to a single appropriation. These include the laboratory offices of research and technology application (ORTAs) and the Small Business Innovation Research /Small Business Technology Transfer Pilot Program (SBIR/STTR).

The attached table provides the details.

DOE TECHNOLOGY PARTNERSHIP FUNDING UPDATE ($ MILLION) BY APPROPRIATION AND PROGRAM OFFICE

March 6, 1995

APPROPRIATION	FY 1993	FY 1994	FY 1995	FY 1996
ENERGY SUPPLY RESEARCH AND DEVELOPMENT				
ER	$166.4	$257.4	$301.1	$330.2
EE	500.0	550.0	800.0	800.0
NE	49.5	51.4	54.1	49.6
ATOMIC ENERGY DEFENSE WEAPONS ACTIVITY				
DP	141.0	211.5	219.9	231.9
DEFENSE ENVIRONMENTAL AND WASTE MANAGEMENT				
EM	49.0	58.7	71.7	75.1
FOSSIL ENERGY RESEARCH AND DEVELOPMENT				
FE	54.3	60.0	60.0	60.0
CLEAN COAL				
FE	0.0	290.0	205.3	228.8
GENERAL SCIENCE				
ER	21.6	21.6	28.2	22.1
TOTAL	$981.8	$1,500.6	$1,740.3	$1,796.7

Mr. Myers. For the record, please provide a table showing the technology transfer funding by program at each facility in fiscal years 1993, 1994, 1995, and 1996.

Dr. MacLachlan. The requested information will be collected from the facilities and will be submitted to the committee no later than April 24, 1995.

Mr. Myers. Please identify the administrative costs relating to technology transfer activities at each laboratory or facility in fiscal years 1993, 1994 and 1995.

Dr. MacLachlan. See the attached table. It should be remembered that the laboratory directors control their staff assignments and that each management and operating contractor, and each laboratory, has its own cost accounting system.

Laboratory Technology Transfer Administrative Funding ($ Thousands)

	1993	1994	1995	1996
Ames Laboratory	265	260	323	332
Argonne National Laboratory	1,670	2150	2395	2,515
Brookhaven National Laboratory	913	1116	1145	1,150
Continuous Electron Beam Accelerator Facility	0	325	625	625
Energy Technology Engineering Center	57	174	190	285
Fermi National Accelerator Laboratory	320	325	361	376
Idaho National Engineering Laboratory	1,489	3196	5600	7,000
Inhalation Toxicology Research Institute	332	251	399	427
Lawrence Berkeley Laboratory	1,314	1662	2808	2,950
Lawrence Livermore National Laboratory	3,249	5957	6856	4,600
Los Alamos National Laboratory	10,000	5300	5300	6,800
Morgantown Energy Technology Center	0	918	938	950
National Renewable Energy Laboratory	1,417	1921	2258	2,519
Oak Ridge Institute for Science & Education	119	111	149	161
Oak Ridge National Laboratory	8,618	18181	15016	20,766
Pacific Northwest Laboratory	3,050	3897	4078	4,180
Pittsburgh Energy Technology Center	0	1479	1545	1,543
Princeton Plasma Physics Laboratory	260	270	266	278
Sandia National Laboratory	7,500	8110	9375	9,372
Savannah River Technology Center	2,317	4200	4200	4,200
Stanford Linear Accelerator Center	190	210	365	360
Superconducting Super Collider Laboratory	328	0	0	0
Total	$43,080	$60,013	$64,192	$71,389

Mr. Myers. Are these costs charged to overhead?

Dr. MacLachlan. The laboratories approach this matter differently. Some laboratories charge some of the costs to overhead. Each laboratory has a different cost accounting system, and there is not a single uniform answer.

Mr. Myers. In a response to a question last year, the Department identified administrative costs of $61.3 million to manage the technology transfer programs at each facility, and 35 percent of these costs were at Los Alamos and Sandia. Why did the administrative costs of these labs exceed those of other facilities?

Dr. MacLachlan. In FISCAL YEAR 1994, the total cost of the technology transfer process (which includes the laboratory technology transfer office, intellectual property protection, and related services such as accounting, general legal services, publications, training, time spent by technical staff in discussion with potential partners, and procurement) at all of the DOE laboratories and facilities was $60 million, expected to increase to $64 million in FISCAL YEAR 1995. None of this is the cost of the projects and research work. Of this latter total, the amount at Los Alamos was $5.3 million and that at Sandia was $9.3 million. Los Alamos and Sandia together had about 23 percent of the total. This is all information provided to the Office of Management and Budget in a regular annual report on technology transfer provided each January.

By comparison, DOE expects to provide about $ 328 million in CRADA funding during fiscal year 1995. Los Alamos and Sandia together account for about 31 percent of all Department CRADAs (361 out of 1157 as of January 19, 1995), so the percentage breakout of administrative cost is reasonably in line with the percentage breakout of CRADAs. It is also worth noting that Los Alamos and Sandia together accounted for 33 percent of licenses to intellectual property awarded by the Department's laboratories in fiscal year 1995. In fact, the percentage of technology transfer administrative costs for Los Alamos and Sandia together is actually less than their combined share of CRADA activity and licensing activity.

Mr. Myers. What can be done to reduce the administrative costs of these programs?

Dr. MacLachlan. Administrative costs are decreasing relative to the amount of technology transfer activity. As of the beginning of fiscal year 1992, the Department's laboratories had entered into 44 CRADAs, while there were 1059 CRADAs in place as of the end of fiscal year 1994. Another way of viewing this is that the money spent by the Department to improve the process of technology transfer has had that result, and the sharply increasing number and value of CRADA collaborations is one value received for these expenditures.

It is worth noting that these administrative and related costs include not only the cost of entering into CRADAs, but also the costs associated with laboratory intellectual property protection and licensing (which are incurred whether there are CRADAs or not), technology transfer outreach (publications of various types, participation in trade shows and other outreach events) and training and participation in technology transfer process improvement measures (such as development of the modular and short-form CRADAs and improvement in the reimbursable work process for non-Federal partners). In short, these costs are for the process of technology transfer, which is broader than just CRADAs. These costs are not allocated out of CRADA funds.

It is also worth noting that laboratory patent applications, a key aspect of intellectual property protection, have increased from 432 in fiscal year 1992 to 569 in fiscal year 1994 and are projected to be 668 in fiscal year 1995. The number of new laboratory licenses has also increased sharply over the same period, from 215 to 507 with 638 new licenses to laboratory intellectual property anticipated in fiscal year 1995.

In addition, the Department has undertaken several initiatives that will reduce administrative costs and streamline the Department. These may help to further reduce the cost of administering technology transfer programs.

Mr. Myers. The Galvin report recommended linking some portion of the Small Business Innovation Research Program (SBIR) to CRADA objectives. Do you see merit in this proposal?

Dr. MacLachlan. The recommendation you refer to is on page 50 of the Galvin report, which recommends independent peer review for CRADA proposals as is done for SBIR grant proposals, in order to improve the quality of Department CRADAs in terms of "...validity of the proposed work and its relevance to the DOE mission..." It might be worth considering a pilot program, in which a selected percentage of CRADAs for the same funding program and laboratory were subjected to such a process and then tracked to see if the resulting quality of the projects were measurably different than those selected by the Department's standard practice. We will consider such a pilot project.

EVALUATION OF MATH AND SCIENCE EDUCATION INITIATIVES

Mr. Myers. What performance measurements are used by the Department to evaluate the effectiveness of these education programs?

Ms. Rumsey. Performance measurements include improvement of student performance in mathematics and science; increased participation in scientific and technical careers, especially by members of under-utilized populations; increased numbers of students pursuing advanced degrees in scientific disciplines; and congruence of the program with the National Education Goals and the Department of Energy's missions.

Mr. Myers. Which programs have been evaluated to date and what were the results of the evaluations?

Ms. Rumsey. National programs such as the Laboratory Cooperative Research Experience, Science Engineering Research Semester, High School Honors, Teacher Research Participation and the Prefreshman Enrichment Program have been evaluated. Approximately every five years an evaluation report is published on these programs.

Precollege teacher development and student programs have undergone formative evaluation to determine how the programs compare to what has proven effective in 'research and best practice.' The Department developed a series of success templates of 'best practice' based on Department of Education and National Science Foundation research using the expertise of the National Center for Improving Science Education to implement this formative evaluation.

As a result, all programs evaluated showed improvement in all areas. However, more significant improvement was needed in the programs connection to systemic reform and in accomplishing increased knowledge about careers in science and math.

Further, these programs are being studied to identify short term and intermediate performance results. Tools to measure these performance results are being modified and tested by the National Center for Improving Science Education. All formative and impact reports on these programs will be completed by May 1996.

Additionally, a selection of precollege programs have been chosen in the National Science and Technology multi-agency teacher development study to determine what is 'best of practice' in order to update the research in this area. This study uses the success templates developed by the Department and the National Center for Improving Science Education. This study will be completed in 1996 and will provide the Department with the best program models for teacher development for its program portfolio.

Mr. Myers. Did any evaluations cause significant changes in the direction of a program?

Ms. Rumsey. Yes, these evaluation results:

1. enabled the Office of Science Education Programs to develop a portfolio of highly effective precollege programs with a common set of performance-based goals designed to deliver the National Education Goals,

2. ensured that the precollege programs all evidence a connection to a systemic reform effort and participant performance outcomes in science, mathematics or technology knowledge and ability and career information,

3. yielded the creation of a systemic reform template for formative evaluation of precollege programs and impact tools that determines a program's long-term reform contribution,

4. produced an evaluation management plan that will be completed by the end of 1995,

5. spawned the development of a post-secondary template that is being field tested in 1995,

6. caused the assessment of Department data base needs for education programs resulting in the implementation of a comprehensive data base,

7. contributed to a Department-wide mapping of all of the Department's education programs to determine these programs' purpose, how well they work, who they serve, their cost, and programmatic gaps, and

8. instilled in all of us the need for rigorous program management of performance goals to ensure program effectiveness.

Mr. Myers. What types of education activities performed by the Department and its laboratories are considered to be the most beneficial and cost-effective?

Ms. Rumsey. We have found that the most effective educational activities performed by the Department are those that capitalize on the prior investments made in the Department's national laboratories, their highly-skilled scientists, engineers and technicians, and their state-of-the-art facilities and equipment. Further, when our education programs follow the Department's business lines and the national education goals, we find effective programs that are structured to deliver well-articulated, long-term results that address critical national needs. Consequently, within our programs, the most beneficial and cost-effective activities are in the Laboratory Cooperative Science Center programs. These programs reach students and faculty nationwide. Because of the well-recognized effectiveness of these programs, our resources are routinely leveraged by the academic community, state and local governments, and the private sector enabling us to provide highly cost-effect support to the largest faculty and student audience possible.

FUNDING AND DESCRIPTIONS OF SCIENCE AND MATH EDUCATION PROGRAMS

Mr. Myers. By organization and program, please identify the funding for all DOE education programs in fiscal years 1994, 1995, and 1996.
(See next question.)

Mr. Myers. Describe each type of education program supported by the Department and the funding for each in fiscal years 1994, 1995, and 1996.

Ms. Rumsey. The Office of Science Education and Technical Information funded four specific programs in fiscal year 1994. We identified one of those programs for transfer in fiscal year 1995 because it was not wholly an education program. The information follows:

FUNDING FOR OFFICE OF SCIENCE EDUCATION PROGRAMS
(in Thousands of Dollars)

	FY 1994	FY 1995	FY 1996
Laboratory Cooperative Science Centers	$34,158	$30,315	$30,035
University Programs	$16,912	$27,082	$17,377
University Research Instrumentation	$640	$5,647	$5,647
University Reactor Fuel Assistance	$3,563	-	-

Further, we are providing a description of some of the Science Education activities and programs we support and I would like to insert them for the record.

The Office of Science Education and Technical Information, through the University and Science Education Program, is the lead office in the Department for science and mathematics education. Staff in the Office represent the Department on a number of interagency committees concerned with science education including the National Science and Technology Council Committee on Education and Training R&D. Most, but not all, of the programs supported by the Office are conducted at or with the involvement of scientists and staff at the Department's national laboratories and contractor research facilities. A summary of the programs by education level supported by the Office is as follows:

SUMMARY OF OFFICE OF SCIENCE EDUCATION PROGRAMS PRECOLLEGE EDUCATION ACTIVITIES

Programs for Precollege Teachers

Each Department laboratory and facility receives support from the Office of University and Science Education to support training and enrichment programs for science and mathematics teachers in schools within convenient "commuting" distance to the laboratory In addition, there are two national precollege teacher initiatives administered directly by the Office.

The Teacher Research Associates Program (TRAC) selects teachers on a national basis for participation in hands-on research during the summer at one of 29 participating Department laboratories or facilities. In 1994 there were 322 teachers from 45 states the District of Columbia and Puerto Rico participate in this program. Each teacher is involved in a direct research experience with a scientific mentor at the host laboratory and is also provided assistance in "transferring" the research experience back to the classroom. A comprehensive evaluation and assessment strategy has been developed to measure the qualitative impact of the TRAC experience on student learning.

The Federal Laboratory Summer Teacher Enhancement Program (STEP) provides middle and high school science, mathematics and technology teachers an opportunity to spend four weeks at a Federal research facility in hands-on education programs in such varied areas as environmental and ecological studies, materials science, and alternative energy and conservation. These programs are designed to give teachers the experiences and information that will improve their ability to teach innovative, effective science courses. Six hundred teachers participated in 17 institutes in fiscal year 1994. Many administrators, as well as teams of teachers from a school district also attended to ensure a systemic improvement in the classroom.

Teacher participants evaluate the success of every program, and the results are used to ensure that these programs meet the needs of the teachers. Each of these institutes has been designed using the teacher development success templates to ensure the incorporation of the 'best of research and practice.'

Programs for Precollege Students

The DOE High School Science Student Honors Research Program, initiated in 1985, brings the very best high school science and mathematics students to the Department's national laboratories for two weeks of intensive, hands-on research in the summer. Students are selected for participation in the program through competitions from each of the 50 States, the District of Columbia, Puerto Rico, American Samoa and Guam. Students from Mexico, Canada, Japan, Australia, Germany, Great Britain, France, and Italy also participate with their U.S. counterparts in the program. Each laboratory involved in the program specializes in a discrete area of research. These are: Argonne-materials sciences; Brookhaven--synchrotron radiation research; Oak Ridge-environmental research (water quality); Fermilab-high energy physics; Berkeley-genetics; Sandia--engineering; Lawrence Livermore-computational sciences. The U. S. student participants are "tracked" through their subsequent college and early professional careers. Many of the students return to the national laboratories for subsequent summer and semester-length research experiences. Five of the initial group of 52 students have been hired by the national laboratories following receipt of their doctoral degrees

The National High School Science Bowl was initiated in 1991 and is an annual competition involving teams of math/science students from high schools across the country. This program was designed to celebrate student achievement in science. In 1995, 8,000 students from 1,600 high schools participated in 55 regional competitions sponsored by DOE laboratories, field offices, and contractor facilities, other Federal agencies and educational institutions. The winning teams will travel to Washington for the national finals held in May. The National Science Bowl is co-sponsored with the Cray Research Foundation, Bechtel, Texas Instruments, IBM, British Petroleum/Alaska. Local business and community organizations provide substantial local and regional financial and "in-kind" support. Top prizes for the winning teams include a trip to Australia for participation in the International School of Physics, and science camps at Department of Energy research facilities.

The PreFreshman Enrichment Program (PREP) is a competitive program which provides intensive study for math/science/engineering subjects for women and under-represented students in Grades 6-10. The purpose of the PREP is to capture and retain student interest in science and engineering by providing a number of enrichment experiences, including laboratory work, field trips, tutoring, and career counselling. In 1994, over 3000 students attended one of 52 academic institutions. PREP is not a 'best and brightest' program. Rather, PREP includes students who might otherwise be unmotivated to pursue education and career paths in science and engineering. Follow-up studies show that about half of the students continue to have an interest in science and engineering-related careers.

Programs for Long-Term, Systemic Reform

One of the major goals of the Federal interagency effort to improve mathematics and science education on a national basis is to ensure long-term, systemic reform. This strategy results in fundamental changes in science education and includes working with all stakeholders and customers of the education system--teachers, administrators, students, parents, state and local government agencies, community organizations and business. Many National laboratories and facilities are providing a program to support the change and may also be part of the change team through local, regional or state partnerships. These National laboratory partnerships are "customized" based on local needs and opportunities but can include participating in the innovative science and math curriculum development, providing teacher and student programs to meet rigorous goals and standards and providing leadership to the reform effort through knowledge of how systems work.

Examples of systemic reform contributions involving Department laboratories and facilities include:

Los Alamos National Laboratory in New Mexico, a partner in New Mexico's state systemic initiative, contributes leadership and program support Schools participating in the New Mexico systemic reform effort showed increases in the Iowa Test of Basic Skills test scores in math and in science.

Science Achievement scores at Washington Middle School, Yakima, Washington, have risen in the 1994. The California Test of Basic Skills showed significant improvement in science scores at the 7th, and 8th grade levels. This school is one of five schools that participate in the Pacific Northwest Laboratory's OPTIONS program which works to increase student performance in science.

As part of the Washington State systemic reform initiative, Pacific Northwest Laboratory, spearheaded the effort to develop a memorandum of understanding between the Washington Science Teachers Association, the Washington Technology Education Association, and the Washington State Mathematics Council which resulted in a coordinated science and math curriculum, instruction and assessment in the State.

The Idaho National Engineering Laboratory scientists, through a program called Technology Reaching Elementary Kids(TREK), has caused a marked increase in elementary educator confidence and willingness to teach discovery-based science. The laboratory requires that TREK be aligned with school system goals. This requirement has supported reform in the Idaho Falls area schools. Administrators now have monthly meetings with district officials and teachers to determine how the TREK visits by laboratory scientists will best fit with curricula and student needs.

The Trenton, New Jersey Public Schools science curriculum for grades K-12 has been revised to align with national and state standards through a systemic reform partnership which includes Princeton University Plasma Physics Laboratory(PPPL). PPPL has provided over 100 teachers who have completed 40-120 hours in teacher development workshops. Over 600 teachers have participated in shorter in-service workshops provided by the Laboratory. The Laboratory's scientists and engineers have contributed to structural reforms such as an increase in resource allocation for science materials, hands-on curricular materials as replacement for outdated text books

The Continuous Electron Beam Accelerator Facility has met the request of the Virginia State Systemic Reform effort by providing 'best of practice' student and teacher workshops which engage the participants with hands on science activities by involving scientists from the Lab. The results are: students gained a richer, more specific and more realistic idea of what scientists do, their interest in careers and courses in science increased, 96% of the teachers reported they significantly increased their knowledge of applications and classroom activities and 98% of the administrators who attended a two-day science workshop ranked it among the top 25% of workshops they had attended.

Lawrence Berkeley Laboratory, Lawrence Livermore Laboratory, Los Alamos National Lab, SANDIA National Laboratory, Oak Ridge Institute for Science and Education, Oak Ridge

National Laboratory, the Mound Facility, Fermilab and Argonne National Laboratory all participate in systemic reform efforts.

SUMMARY OF OFFICE OF SCIENCE EDUCATION PROGRAMS
UNIVERSITY LEVEL EDUCATION ACTIVITIES

Programs for Undergraduate, Graduate Students and Faculty

The Department has had a long tradition of providing research opportunities for university faculty and students at the national laboratories. These opportunities include summer research appointments for faculty and students, academic year "sabbatical" appointments for faculty members, faculty/student team research, graduate student dissertation assistance and support. Each summer, approximately 1500 undergraduate students and faculty members conduct research projects at the laboratories supported with University and Science Education funds. Selections of participants in the summer programs are made by the respective laboratories.

One national undergraduate student program administered by the Office of University and Science Education is the Science and Engineering Research Semester Program. This competitive program provides opportunities for 400 students each year to participate in semester-length research experiences at seven participating national laboratories. These experiences encourage students to pursue advanced degrees in scientific disciplines, consider high paying careers requiring analytical skills, and identify energy specific areas of research for further pursuit.

SUMMARY OF OFFICE OF SCIENCE EDUCATION PROGRAMS
PUBLIC SCIENCE LITERACY ACTIVITIES

Most of the Department's education programs encourage the participating students to pursue advanced degrees in scientific disciplines or careers requiring skills grounded in science, engineering and technology. Along with other Federal agencies which have strong science missions and fund science education, we have also made a commitment to increase scientific and technological literacy of all Americans. Some major initiatives in this area are as follows:

NEWTON: an electronic bulletin board at Argonne National Laboratory represents the public's ability to access the Information Superhighway through education technology. In 1994, with funding of $47K:• 200 teachers were trained for 15 hours on telecommunications usage; 100 students had one day instruction on NEWTON; 10,000 became registered users on the bulletin board; 200,000 log-ins were made during the year; and 8,000 questions were asked of DOE scientists in the "Ask-a-Scientist" area of NEWTON. From the number of log-ins only, the $47K investment equates to less than $.25 per log-in.

New Explorers with Bill Kurtis: public science literacy, faculty and student programs, and education technology is combined in this an award winning PBS corporate-underwritten television series with

DOE and other partner sites developing educational materials for use in the classroom. Now in its fifth year on PBS, the Department's fiscal year 1994 funding for the project was $1.4M which included 3 million students and 100,000 teachers participating in a teleconference with Dr. Paul Sereno, a "New Explorer" who discovered a new species of dinosaur. Also WTTW, a television station in Chicago, cites 8 million viewers each week for "The New Explorers, which equates the DOE investment to be $.17 per viewer in one week.

The Museum Science Education Program: Over the past four years, $3.7M has been awarded to 37 institutions representing 25 states for energy-related media. A sample of projects include the following: promoting the Lawrence Berkeley Laboratory Hands-On Universe astrophysics research program in an exhibit at the Boston Museum of Science and the Macon Museum of Arts in Sciences in Georgia; Sandia National Laboratory is assisting in the development of an OMNI-MAX film, "Why is Music, Music" for the Museum of Science and Industry in Chicago. The combined visitation for these large and small museums, science-technology centers, children's museums, zoos and aquaria is 18.6 million people per year. This places the DOE funding to be $.20 per visitor.

Magic School Bus: a popular PBS television series designed to motivate children's interest in science; introduces science concepts and ideas, and inspires positive attitudes towards science and education. The Departments funding involvement with this 1994 Parents' Choice Goal Medal television series winner, builds on the joint endeavors of two programs. One is with Scholastic Productions for a fully animated television series based on the popular series of science books of the same name. Additionally, we supported the co-principal investigator, a Fermilab, female electrical engineer in writing a successful grant of $1M to the National Science Foundation for Magic School Bus education activities. The results of this grant reach more than 100 museums across the country with its components of a traveling exhibit, activity trunks and theme kits with materials for setting up a Magic School Bus activity corner in affiliated museums.

The viewing audience for the Magic School Bus is two million each week. With the Department's investment of $1.5M over three years for the development of the series, the investment is approximately a penny and a half per viewer, per episode.

In addition to the above, DOE laboratories and facilities also conduct a number of formal and informal programs for teachers, students, and parents on science and technology subjects. These include in-house tours and lectures; community outreach programs; judging of science fairs; and a variety of special events. For example, Los Alamos National Laboratory offers workshops for families through "Science at Home". Brookhaven National Laboratory sponsors a weekly parent/student computer awareness program. DOE National laboratory scientists and engineers volunteer their time and efforts to support this public literacy commitment.

Other Educational Programs

DOE laboratory scientists have produced a number of instructional materials and "modules" for use in science and mathematics classes. These include a year-long course on materials science and technology for high school juniors and seniors developed by scientists at the Pacific Northwest

Laboratory. This course has been available nationally through the National Diffusion Network sponsored by the Department of Education. Other instructional modules have been developed by laboratory scientists in such fields as global climate change, acid rain, renewable energy, energy efficiency and conservation, superconductivity, environmental preservation, radiation, and other areas.

Two unique programs sponsored by the University and Science Education Program provide direct access to "real science" for teachers and students through distance learning networks. The National High School Supercomputer Program is located at the Lawrence Livermore National Laboratory and provides access to a Cray-donated X-MP supercomputer to high schools across the country. Students may access the supercomputer to carry out research in such areas as global climate change, particle physics, seismicity, three-dimensional modelling, aerodynamics and plant physiology using mathematical models and simulation software on the supercomputer. Workshops for teachers on how to access and use the supercomputer are conducted throughout the country by Livermore and Cray staff. The Lawrence Berkeley Laboratory Hands-On Universe Program provides access to a remote-controlled telescope used by Berkeley astrophysicists to study supernovas and other distant stellar features. Teachers and students are provided time on the telescope to search for stellar phenomena including asteroid detection. The images are collected, downloaded, digitized and sent directly to the participating schools where the students and their teachers can perform follow-on analyses using their own personal computers. In 1994, 50 teachers piloted the program for their 1,000 students in their classrooms.

FUNDING FOR SCIENCE EDUCATION PROGRAMS IN OTHER PROGRAM OFFICES

We collected cross-cut data from other organizations in the Department for their funding of education programs. The information follows:

Science Education Programs
(in Thousands of Dollars)

	FY 1994 Actuals	FY 1995 Estimate	FY 1996 Request
BONNEVILLE POWER ADMIN			
K-12	**$1,100**	**$800**	**$750**
Undergraduate	**$700**	**$600**	**$500**
Subtotal	**$1,800**	**$1,400**	**$1,250**
DEFENSE PROGRAMS			
K-12	**$11,992**	**$11,245**	**$11,475**
Undergraduate	**$3,611**	**$3,664**	**$3,652**
Graduate	**$3,611**	**$3,663**	**$3,652**
Science Literacy	**$1,270**	**$1,428**	**$1,221**
Subtotal	**$20,484**	**$20,000**	**$20,000**

ECONOMIC IMPACT & DIVERSITY			
K-12	$233	$160	$160
2 Yr Undergraduate	$536	$597	$597
Undergraduate	$1,247	$1,193	$1,193
Graduate	$40	$0	$0
Subtotal	$2,056	$1,950	$1,950
ENERGY EFFICIENCY/RENEWABLE			
K-12	$282	$642	$902
Undergraduate	$4,370	$5,496	$6,890
Graduate	$11,317	$12,625	$13,012
Science Literacy	$7,313	$9,233	$12,749
Subtotal	$23,282	$27,996	$33,553
ENERGY RESEARCH			
K-12	$2,621	$3,238	$3,125
Undergraduate	$1,260	$1,926	$1,779
Graduate	$29,854	$23,010	$23,021
Science Literacy	$62	$485	$549
Subtotal	$33,797	$28,659	$28,474
ENVIRONMENTAL SAFETY/HEALTH			
Graduate	$1,870	$1,950	$1,950
Subtotal	$1,870	$1,950	$1,950
ENVIRONMENTAL MGMT			
K-12	$2,410	$0	$0
2 Yr Undergraduate	$2,285	$625	$6,700
Undergraduate	$14,250	13,300	$0
Graduate	$2,000	$1,000	$0
Subtotal	$20,945	$14,925	$6,700
FOSSIL ENERGY			
Undergraduate	$2,975	$3,000	$3,500
Graduate	$2,975	$3,000	$3,500
Subtotal	$5,950	$6,000	$7,000
NUCLEAR ENERGY			
Undergraduate	$1,300	$5,500	$7,700
Subtotal	$1,300	$5,500	$7,700
RADIOACTIVE WASTE MGMT			
K-12	$250	$250	$150
Undergraduate	$2,632	$2,315	$2,485
Graduate	$2,632	$2,315	$2,485

Science Literacy	$1,460	$1,834	$1,900
Subtotal	$6,974	$6,714	$7,020
WESTERN AREA POWER ADMIN			
Undergraduate	$60	$60	$60
Subtotal	$60	$60	$60

SUMMARY OF SCIENCE EDUCAITON PROGRAMS IN OTHER PROGRAM OFFICES

I would also like to submit a listing of some of the Science Education activities sponsored by various program offices in the Department.

Program Office: Environmental Management

Environmental University Consortia
These consortia are partnerships between Historically Black Colleges and Universities and other minority institutions. The established consortia share commonality in environmental technologies curriculum development, faculty and teacher development/recruitment, student recruitment and career counseling, and student scholarship and internship opportunities. The partnerships are principally for minority and educationally disadvantaged students. Current consortia:

Technology and Waste Management Consortium (Minority Universities)
South Carolina Universities Research and Educational Foundation
Waste Management Education and Research Consortium, New Mexico
Partnership for Environmental Technology Education (National Program)
American Indian Higher Education Consortium

Undergraduate Scholarships
A variety of programs provide scholarships for undergraduate students pursuing associates of bachelors degrees in disciplines related to environmental restoration and waste management. These programs provide financial support through payment of stipends, tuition, fees, and in some cases travel expenses, to students at qualified academic institutions nationwide. Summer internships at a Department of Energy Laboratory are a part of some scholarship programs. Several of these scholarships are aimed at minority groups.

Graduate Fellowships and Internships:
Fellowships are awarded to students seeking advanced degrees in areas related to environmental restoration and waste management. The fellowships support of graduate study and thesis research for full time students. Internships and some fellowships include a summer practicum at a Department of Energy facility. Programs are also available for faculty members to participate collaborative research with the U.S. Department of Energy.

Community College Course and Degree Enhancement

DOE sponsored programs related to waste management and environmental restoration technician training are underway at several community colleges near Department of Energy facilities. Programs targeting under-represented minority students offer university level science and math courses, summer work experiences at a DOE facility, and programs that encourage students to explore environmental sciences at the high school level.

Program Office: Defense Programs

Education Technology

Defense Programs runs a variety of education technology programs including: virtual reality applications to education; distance learning, on-line Education Information database and Internet curriculum models for schools.

Undergraduate Scholarships

The Cooperative Developmental Energy Program (CDEP) awards scholarships to students majoring in science and technology. The program, based at Fort Valley State College in Georgia, has improved the school's infrastructure by establishing engineering and geoscience laboratories. Indeed, CDEP operates the only geoscience focused energy internship program among the 117 Historically Black Colleges and Universities. Since the program began, CDEP students have participated in 548 energy-related internships and co-op assignments.

Program Office: Energy Efficiency and Renewable Energy

Cooperative Education Engineering Programs

Educational partnerships with Historically Black Universities to develop a cadre of engineering students who have an in-depth knowledge of energy issues, a sensitivity toward environmental preservation, and an understanding of the economic factors which affect national energy programs and policies.

Energy Efficiency and Renewable Energy Public Education Programs

The office of Energy Efficiency and Renewable Energy sponsors a number of education programs relating to public understanding of energy efficiency and renewable energy issues, public awareness programs and other Science Literacy programs..

Program Office: Fossil Energy

Precollege Education Partnerships

The Pittsburgh Energy Technology Center and the Morgantown Energy Technology Center both have partnerships with local school districts. These programs are designed to increase interest in science and technical careers.

University Programs

The Office of Fossil Energy sponsors the University Coal Research Program that fosters research and development with Universities on a 50/50 split basis.

Program Office: Civilian Radioactive Waste Management

"Science, Society, and America's Nuclear Waste" curriculum unit

This program includes a four-unit, 30 lesson plan secondary curriculum on radioactive waste management. The curriculum is available to all middle and secondary schools for classroom use. The program provides nationwide satellite teacher workshops on the curriculum and national and regional workshops around the country to introduce this material. The material will be used as a model for the development of a similar elementary curriculum and upgrading to a college-level curriculum.

Outreach

This program element includes activities directed to the general public intended to build public science literacy by providing accurate information about the national high-level radioactive waste management program.

Program Office: Office of Minority Economic Impact

Minority Undergraduate Training for Energy Related Careers

This program is currently funding twelve institutions which have a 20 percent or more minority enrollment and which have a history of graduating minority students in the fields of mathematics, computer science, and life sciences or engineering. The objectives of the program are to increase the number of minority students that select a course of study leading to energy related careers, enhance the quality and quantity of energy-related undergraduate research and training provided to minorities, and increase the pool of minority students selecting graduate study in energy related disciplines.

Minority Honors Training and Industrial Assistance Program

The Honors program is a nationwide program in energy-related technologies at eight two-year colleges. Each of the institutions provide student assistance in the form of scholarships, and special activities including role models and tutoring. Support is provided to the institutions to assist in the development and expansion of linkages with industry. Student recruitment and retention are emphasized at each institution.

Program Office: Bonneville Power Administration

Bonneville Co-Op Program

This program is designed to enrich undergraduate students' education by providing meaningful work experiences throughout their academic study. Work available through the program includes, for example, power system analysis; testing, research and development; transmission and substation engineering; maintenance; and power management.

Summer Science Camps

A collaborative effort between the Department of Energy, Bonneville Power Administration, local school districts, community agencies, businesses and park bureaus to provide summer science camps for children in Grades 4-6. Camps run daily for two weeks, and focus on providing opportunities to young women, minorities, and students in low income, low achieving neighborhoods. Curriculum provides a fun hands-on learning experience, and each camp includes science related field trips.

Precollege Education Activities

In partnership with local school districts and community organizations a variety of science enrichment programs are provided including: an after-school science enrichment classes for Pre-K to Grade 6 students, workshops for K-12 students, summer work experiences for high school students with mentor scientists and engineers, and the FutureMakers Inventor/Mentor Program, which provides education partnerships between middle school students and industry. Bonneville power administration also provides a teacher enhancement program through Industry Initiatives for Science and Math Education (IISME).

Program Office: Western Power Administration

Federal Junior Fellowship Program

This program provides career-related employment as well as tuition assistance for, outstanding high school seniors who, upon graduation from college, may be offered permanent employment.

Program Office: Environment Safety and Health

Environment, Safety and Health Graduate Fellowships

The office of Environment, Safety and health runs two graduate level fellowship programs, one in health physics, and one in industrial hygiene.

Program Office: Nuclear Energy

Nuclear Energy Targeted Sector Program.

The Nuclear Energy Training Program is designed to assist students attending Historically Black Colleges and Universities (HBCUs), Hispanic Serving Institutions, and Native American Institutions through training, study, research participation, and academic enrichment of students and faculty.

MATH AND SCIENCE EDUCATION PROGRAM COST PER PARTICIPANT

Mr. Myers. What is the average cost per participant of each education program.

Ms. Rumsey. The cost per participant is based on several factors and varies from program to program. The variables include capitalizing on previous investments made in the National laboratories, length and type of program and replicability of a program, just to name a few.

As an example, the Teacher Research Associates Program, an 8-week middle and high school teacher program, conducted at 29 DOE labs and facilities in fiscal year 1994 for $2M. Three-hundred-twenty-two teachers from 45 states participated averaging $6,100 per teacher including their $550.00 per week stipend. The Bay Area Science and Technology Education Collaboration (BASTEC) is a systemic reform initiative for both K-12 faculty and students in the Oakland, California Unified School District. Four DOE laboratories and facilities participate in this program reaching 92 schools, 3,000 teachers and 55,000 students. The cost in fiscal year 1994 was $479K which equates to $9.00 per student.

The NEWTON program, an electronic bulletin board at Argonne National Laboratory represents faculty and students ability to access the Information Superhighway through education technology. In 1994, with funding of $47K: 200 teachers were trained for 15 hours on telecommunications usage; 100 students had one day instruction on NEWTON; 10,000 became registered users on the bulletin board; 200,000 log-ins were made during the year; and 8,000 questions were asked of DOE scientists in the "Ask-a-Scientist" area of NEWTON. From the number of log-ins only, the $47K investment equates to less than $.25 per log-in.

The New Explorers with Bill Kurtis incorporates public science literacy, faculty and student programs, and education technology by combining an award winning PBS corporate underwritten television series with DOE and other partner sites developing educational materials for use in the classroom. fiscal year 1994 funding for the project was $1.4M which reached 3 million students and 100,000 teachers participating in a teleconference with Dr. Paul Sereno, a "New Explorer" who discovered a new species of dinosaur. Also WTTW, a television station in Chicago, cites 8 million viewers each week for "The New Explorers, which equates the DOE investment to be $.17 per viewer in one week.

DEPARTMENT OF ENERGY/EXPERIMENTAL PROGRAM TO STIMULATE COMPETITIVE RESEARCH (DOE/EPSCoR)

Mr. Myers. Describe the Department's EPSCoR program including funding by year and identify by task how the funds are spent in fiscal years 1994, 1995, and 1996.

Ms. Rumsey. In fiscal year 1991, four million dollars was funded to initiate the Department of Energy's EPSCoR program. The Department awarded 18 one-year planning grants of $100,000 each to the EPSCoR states. In addition, eight of the EPSCoR States received $250,000 awards for traineeships to enable approximately 90 science and engineering graduate students to work on energy-related projects.

Support to students was the focus of the $5.0 million fiscal year 1992 program. In that funding cycle, twelve two-year traineeship awards were made. As a result, approximately 150 graduate students were supported from September, 1992 to September, 1994.

A total of $5.0 million was funded for DOE/EPSCoR activities in fiscal year 1993. A total of 17 of the EPSCoR states submitted applications to initiate research implementation awards. Four state applications--Kentucky, Louisiana, Maine, and Montana--were competitively selected after a rigorous review process. Each of these states receive two-year implementation awards of up to $1.25 million over the award period. Planning grants of $20,000 were provided to 13 additional EPSCoR states to allow continued refinement of their states' DOE EPSCoR plans based upon the feedback received from the merit review of their implementation awards applications.

In Fiscal year 1994, DOE EPSCoR funding increased to $7.0 million. The States of Alabama, Nevada, and Puerto Rico successfully competed for research implementation awards. Each state will receive $1 25 million for a two-year period. In addition, nine states (Idaho, Kentucky, Maine, Montana, Nevada, North Dakota, Oklahoma, West Virginia, and Wyoming) were competitively awarded grants for up to a maximum of $250,000 for a period of two years for graduate student traineeships. Finally, six additional planning grants of $20,000 were awarded.

During fiscal year 1994, the Department reviewed program activities in the States of Kentucky, Louisiana, Maine, and Montana. The purpose of the site visits was to meet with the principal investigators, administrators, faculty and state business and political leaders involved in the EPSCoR projects, to review program progress; to discuss barriers or obstacles encountered, if any; and to provide technical assistance, as required.

In fiscal year 1995, DOE provided $7.0 million to support DOE's EPSCoR activities. With this funding, the Department will make three to four renewal awards, subject to satisfactory progress in those states that initiated their research implementation awards in fiscal year 1994 (Louisiana, Kentucky, Maine, and Montana). In addition, two to three new EPSCoR research implementation awards of up to $1.25 million for a two-year period will be made, bringing the total number of states with DOE implementation awards to nine. An announcement of the fiscal year 1995 implementation awards is expected to be made early July 1995.

The Department's fiscal year 1996 request for the EPSCoR program is $2.1 million. The requested funding will be used to sustain the activities of existing implementation awards.

OFFICE OF SCIENTIFIC AND TECHNICAL INFORMATION WORK FOR OTHERS

Mr. Myers. How much funding did the Office of Scientific and Technical Information receive from work performed for other Departmental elements and from other federal agencies in fiscal years 1993, 1994, 1995 and estimated for 1996?

Ms. Rumsey. The Office of Scientific and Technical Information provides information management and delivery support and expertise to other Departmental elements. Specific examples of work performed for Departmental elements include Opennet and the Integrated Technology Transfer System. Opennet provides public access via the Internet to over 260,000 Departmental records that were either previously classified or had limited availability. The Integrated Technology Transfer System is a corporate information management system that allows the Department to track and evaluate Cooperative Research and Development Agreements and other mechanisms designed to enhance U. S. industrial competitiveness. Funding provided to the Office from other Departmental elements and federal agencies is as follows:

Funding Received
(In Millions of Dollars)

		Estimates		
	FY 1993	FY 1994	FY 1995	FY 1996
Departmental Elements	$ 3.5	$ 3.1	$ 3.0	$ 2.8
Federal Agencies	.5	.5	.6	.6

UNIVERSITY AND SCIENCE EDUCATION

DEPARTMENT OF ENERGY/EXPERIMENTAL PROGRAM TO STIMULATE COMPETITIVE RESEARCH (DOE/EPSCoR)

Mr. Rogers. Have you had an opportunity to examine the Department's Experimental Program to Stimulate Competitive Research? What is your assessment of the program?

Ms. Rumsey. The Department of Energy's EPSCoR program has been designed to stimulate better research and increase the ability of the EPSCoR states to compete more effectively for federal research dollars. In addition, the DOE program places heavy emphasis on educational activities that will ensure that this country is developing a talented, diverse scientific and engineering workforce that will enable it to compete effectively in the global community. While only in its fifth year at the Department of Energy, progress in these areas is already being made by the EPSCoR states.

Already apparent in the EPSCoR states are a variety of infrastructure building activities and interactions that will enhance the ability of these states to better compete in the competitive research arena. This progress is evidenced by the fact that faculty from different universities are combining their resources to mount larger research efforts; collaborations between the academic community and federal agencies are beginning to form; and the state legislatures and governor's offices are becoming involved in efforts to develop strategic plans to use state resources to support a science and engineering infrastructure within their states.

DOE is also benefitting in a number of ways. Because the DOE EPSCoR program has been structured to encourage collaboration between the Department's national laboratories and the academic community, significant outside expertise is being directed toward studying energy-related research questions. Further, as the program places heavy emphasis on the involvement of students in the research activities of the participating faculty and laboratory staff scientists, DOE is developing a workforce that will help it meet its future needs.

Mr. Rogers. The 1992 Energy Act directs the Office of Energy Research to operate the DOE EPSCoR program. Currently, the program is administered through the Office of Science Education and Technical Information. Is the DOE EPSCoR program "housed" in the proper organization, one that will result in the maximum benefit for the program?

Ms. Rumsey. Yes, it is. As directed in the 1992 Energy Act, the DOE/EPSCoR program was to be managed by the Office of University and Science Education Programs, which, at the time, was part of the Office of Energy Research. In March, 1993, the Department was reorganized and the programs and staff of the Office of University and Science Education Programs were transferred into the newly created Office of Science Education and Technical Information. Because of the unique dual nature of the DOE/EPSCoR program, one that includes a strong education emphasis, the Office of Science Education and Technical Information can utilize its expertise in building the required infrastructure that will allow the EPSCoR states to develop competitive research programs.

The DOE/EPSCoR program places significant emphasis on developing the EPSCoR states' research infrastructure and on enhancing science, mathematics, engineering and technology education in these states. The research needs and interests of the EPSCoR states are more broad than those supported by the Office of Energy Research. The Office of Science Education and Technical Information ensures that its expertise with respect to the EPSCoR program is supplemented by the involvement of a variety of the Department's technical program offices (including the Offices of Defense Programs, Energy Efficiency and Renewables, Energy Research, Environmental Restoration and Waste Management, Fossil Energy, and others).

UNIVERSITY AND SCIENCE EDUCATION

DEPARTMENT OF ENERGY/EXPERIMENTAL PROGRAM TO STIMULATE COMPETITIVE RESEARCH (DOE/EPSCoR)

Mr. Rogers. The DOE Experimental Program to Stimulate Competitive Research is designed to stimulate better research and increase the ability in states that traditionally have lacked strong university-based research efforts to compete for federal research support. This program is authorized by Section 2203 of the Energy Policy Act of 1992. Please provide a status report on DOE's EPSCoR program.

Ms. Rumsey. While the Department of Energy's EPSCoR program is relatively new, significant progress has already been achieved. To date, seven of the EPSCoR states have received research implementation awards of up to $1 25 million; 13 have received graduate student traineeship awards that range from $220,000 to $950,000, and all 19 have received planning awards of approximately $100,000.

The FY 1996 for the program is $2.1 million. Subject to a satisfactory progress review, the requested funding will be used to sustain the activities of the three states that began their research implementation programs in FY 1994, albeit at a reduced rate. At this level, no new research implementation awards will be funded in FY 1996.

Already apparent in the EPSCoR states are a variety of infrastructure building activities and interactions that will enhance the ability of these states to better compete for federal research support in the future. Faculty from different universities are, for example, combining their resources to mount larger research efforts; collaborations between the academic community and federal agencies and industrial partners are beginning to form; and the state legislatures and governors' offices are becoming involved in efforts to develop strategic plans to use state resources to support a science and engineering infrastructure within their states.

DOE is also benefitting in a number of ways. Because the DOE EPSCoR program has been structured to encourage collaboration between the Department's national laboratories and the academic community, significant outside expertise is being directed toward studying energy-related research questions. Further, as the program places heavy emphasis on the involvement of students in the research activities of the participating faculty and laboratory staff scientists, DOE is developing a talented, diverse future workforce needed to accomplish its mission.

Mr. Rogers. What is the FY 1996 budget request for the DOE program?

Ms. Rumsey. The FY 1996 request for the DOE EPSCoR program is $2.1 million.

Mr. Rogers. Is this a competitive, peer-reviewed program?

Ms. Rumsey. Yes, since its inception, DOE has structured a highly-competitive, rigorously peer-reviewed EPSCoR program and, as outlined in the Office of Science and Technology Policy's report to Congress this past July, the Department intends to continue this practice into the future.
The competitive nature of the DOE EPSCoR program compares well with similar scientific grant competitions. While it varies slightly from program to program, on average, one out of five scientific grant applications is funded. DOE's EPSCoR program mirrors this 20% average well. In FY 1993, four out 17 applications for research implementation awards, or 23%, were funded. In FY 1994, this number was about 21%. In FY 1995, 10 applications have been submitted. Two or three new research implementation awards are anticipated. To ensure that the program remains competitive, DOE intends to limit the number of state research implementation awards to a maximum, at any given time, of 9 out of the possible 19.

Rigorous peer review has been a hallmark of the DOE EPSCoR program since its inception. As an example, in FY 1994, two panels were convened to evaluate the merits of the management and coordination, human resource development, and traineeship aspects of the of the DOE EPSCoR applications. In addition, the comments of over 300 technical experts were obtained via mail to assess the merit of the proposed research. A summary panel was then brought together to synthesize these results and recommend the most meritorious of the applications.

Mr. Rogers. Are states that are successful in the DOE EPSCoR competition required to match the federal grant?

Ms. Rumsey. Yes, for the research implementation awards, a one-to-one match, as allowed by the Office of Management and Budget Circular A-110, is required. Not only is this important leveraging of federal dollars, but it has worked to help build a coalition of partners within each state that is important to their infrastructure building efforts. Without the match requirement, faculty would continue to work in isolation. With the match, they are required to collaborate with other faculty, work with the university administration, explore opportunities with business leaders, and establish a dialogue with state officials to secure the needed funds. This symbiosis has resulted in exciting new activity within the states that will ultimately help the EPSCoR states compete more effectively on a national scale. As a result, DOE intends to continue its practice of requiring a one-to-one match for its EPSCoR program.

Mr. Rogers. The Department has developed an implementation plan designed to keep this program highly competitive. Please describe DOE's five year implementation plan for EPSCoR as it was highlighted in the Office of Science and Technology Policy's July, 1994, Report to Congress on the EPSCoR program.

Ms. Rumsey. As detailed in the OSTP's July report to Congress, an implementation plan was developed that would result in a robust, highly-competitive EPSCoR program at the Department of Energy. As part of this plan, the DOE EPSCoR project proposed to continue its graduate student traineeship support and to initiate a new element to allow the program to develop additional faculty expertise in energy-related sciences. Also described in the July Report to Congress, the Department suggested the start of a Faculty Enhancement Awards Program that would enable competitively selected faculty to become involved in research programs at the Department's national laboratories. Over the five-year period of the implementation plan, between 20 and 40 such awards would be made. Faculty who participated in this program become the nucleus around which subsequent research implementation applications are developed. Such a program is particularly valuable to those states that have historically been unsuccessful in their attempts to secure a DOE EPSCoR implementation award.

Further, to allow the states to develop the infrastructure and personnel required to sustain nationally-recognized, competitive research programs, the Department envisions providing 9 of the 19 states with research implementation awards of up to $1.25 million a year for 5 years. The one-to-one match of non-Federal resources will continue to be mandatory.

Mr. Rogers. Is the Department's current budget adequate to meet the program's stated goals and objectives as outlined in your implementation plan?

Ms Rumsey. The FY 1995 budget of $7.0 million will require downsizing and modification of the goals and objectives outlined in the *Office of Science and Technology Policy Report to the United States Congress on the Development and Integration of the Experimental Program to Stimulate Competitive Research,* July 1994.

Is this level of support adequate to sustain a healthy, viable EPSCoR program? While we would clearly like to do more for the EPSCoR states, the FY 1995 level of funding would enable us to sustain a viable program in the Department that is providing significant benefit to our EPSCoR partners. We would, however, not be able to fully fund the research implementation awards.

Mr Rogers. There are four states who received DOE EPSCoR awards with FY 1993 funds. What are the Department's plans regarding these states?

Ms. Rumsey. The four states that received two-year implementation awards in FY 1993 were eligible to submit renewal awards in FY 1995. Three of the states have done so (Louisiana, Maine, and Montana). Due to difficulties with securing the required cost sharing from the state legislature, Kentucky's research implementation award was delayed by approximately nine months. Consequently, Kentucky's EPSCoR Committee elected to postpone their request for renewal funding until 1996.

Assuming satisfactory merit review, it is anticipated that Louisiana, Maine and Montana will receive an additional $1.25 million for the coming fiscal year. Assuming that there is satisfactory progress from year-to-year, it is the intent of the DOE EPSCoR program to fund each implementation award for five funding periods at $1.25 million per funding period. The DOE EPSCoR program is intended to assist the EPSCoR states build the infrastructure that will enable them to develop a competitive position in the scientific funding arena. Building this kind of an infrastructure simply cannot be accomplished in one or two years

Mr. Rogers. Will they be eligible to compete in the next round of awards?

Ms. Rumsey. Yes, all four of these states will be eligible to submit renewal applications in the next round of awards.

THE ENERGY POLICY ACT OF 1992 AND DOE/EPSCoR

Mr. Rogers. The 1992 Energy Act established DOE EPSCoR in the Office of Energy Research. I understand it is currently administered through the Office of Science Education and Technology Information. Why is it part of this office?

Ms. Rumsey. As directed in the Energy Policy Act of 1992, the DOE/EPSCoR program was to be managed by the Office of University and Science Education Programs, which, at that time, was part of the Office of Energy Research. In March, 1993, the Department was reorganized and the programs and staff of the Office of University and Science Education Programs were transferred into the newly created Office of Science Education and Technical Information. Because of the unique dual nature of the DOE/EPSCoR program, one that includes a strong education emphasis, the Office of Science Education and Technical Information can utilize its expertise in building the required infrastructure that will allow the EPSCoR states to develop competitive research programs.

The DOE/EPSCoR program places significant emphasis on developing the EPSCoR states' research infrastructure and on enhancing science, mathematics, engineering and technology education in these states. The research needs and interests of the EPSCoR states are more broad than those supported by the Office of Energy Research. The Office of Science Education and Technical Information ensures that its expertise with respect to the EPSCoR program is supplemented by the involvement of a variety of the Department's technical program offices (including the Offices of Defense Programs, Energy Efficiency and Renewables, Energy Research, Environmental Restoration and Waste Management, Fossil Energy, and others)

NATIONAL BIOMEDICAL TRACER FACILITY

Mr. Bevill. A recent report by the Institute of Medicine on Isotopes for Medicine and the Life Sciences has highlighted several areas in which DOE can play a role in easing shortages of isotopes. Perhaps the most critical problem is the shortfall in the availability of accelerator-produced radionuclides due in part to the reduced operating schedules at LAMPF (LANL) and BLIP (BNL). The panel strongly endorsed the construction of the National Biomedical Tracer Facility or NBTF. What is the status of the $3 million dollars appropriated for FY 1995 to continue work on this facility?

Dr. Krebs. The $3,000,000 dollars for FY 1995 was for possible augmentation of the Project Definition Studies for the development of site-specific designs of the National Biomedical Tracer Facility. These Studies have been submitted to the Department and will be evaluated for their scientific and technical merits by a panel of experts on March 27-28, 1995. Based on the results of this evaluation, we will consider the possible augmentation of the Studies.

Mr. Bevill. Given the importance placed on this facility both as a source of radionuclides and as a facility for education and training, would you provide information on the Department's plan for keeping this facility on track in FY 1996 and 1997?

Dr. Krebs. Based on the evaluations scheduled on March 27-28, 1995, and the recommendations of the Institute of Medicine, we will decide whether it is prudent and cost-effective to augment the Studies for the development of site-specific designs of the National Biomedical Tracer Facility. Alternatively, we may adopt the Brookhaven National Laboratory proposal to upgrade and modify the Brookhaven Linac Isotope Producer to serve as both a source of radionuclides and as a facility for education and training. We expect to reach a decision by June 15, 1995, and will establish an appropriate funding plan.

Mr. Bevill. Are there plans for including construction funds for the NBTF in the FY 1997 budget?

Dr. Krebs. Based on the evaluations of the Project Definition Studies and the recommendations of the Institute of Medicine, funding requirements for the National Biomedical Tracer Facility will be considered during formulation of the FY 1997 budget request.

Mr. Bevill. Is DOE committed to fulfilling the educational mission that has been proposed as an integral part of the NBTF?

Dr. Krebs. The Department has planned all along to develop a training program for radiation physicists as part of a radioisotope production facility. Now our commitment to this educational component of the National Biomedical Tracer Facility has been strengthened by the Institute of Medicine's endorsement of it in their report "Isotopes for Medicine and the Life Sciences" commissioned by the Department and released earlier this year.

THE GALVIN REPORT

Mr. Bevill. The Galvin Report cited several problems that limit the efficiency and cost effectiveness of the DOE's national laboratories: excessive DOE oversight, failure of the labs to work consistently in areas of their greatest strengths, and in some cases a lack of coordination and collaboration of efforts between labs.

In testifying before this committee, Mr. Galvin suggested that part of the problem was the lack of a sufficient "roadmap" for the DOE and its laboratories. How would you interpret this observation as it relates to the Office of Energy Research?

Dr. Krebs. The Director of Energy Research led an effort involving all DOE programs, and laboratory and industry representatives to develop a DOE Strategic Plan for Science and Technology. In addition, the Office of the Director of Energy Research has developed a Strategic Plan for all of the Energy Research programs, including High Energy and Nuclear Physics, Basic Energy Sciences, Biological and Environmental Research, Fusion Energy and Multiprogram Energy Laboratories Facilities Support. Each of these Programs coordinates their programs and ensures effective collaboration among the laboratories in their program areas. They also participate in an institutional planning process that ensures coordination with each laboratory as an institute, and reviews laboratory collaborations. The Programs also develop five-year program plans that will be integrated by the Director of Energy Research, reflected in and consistent with the ER and DOE strategic plans. Planning for the Department's scientific user facilities is an excellent example of the effective results of these processes.

Mr. Bevill. Does your office have a long term, integrated "roadmap"?

Dr. Krebs. As a result of developing a DOE-wide strategic plan for Science and Technology, an Office of Energy Research strategic plan, and an integrated Energy Research five-year program plan, the office has a long term integrated "road map."

Mr. Bevill. The Galvin Report was especially critical of the internal DOE oversight of the labs. He reported in his testimony that lab officials predicted they could cut costs by between 10 to 40 percent by doing away with duplicative and unnecessary oversight. In light of Secretary O'Leary's commitment to limit oversight, do you have plans to reduce laboratory funding accordingly.

Dr. Krebs. In February 1995, the Secretary committed to contribute $10.4 billion toward President Clinton's plan to provide tax relief to middle-income working taxpayers and to reduce the nation's budget deficit. Savings from working smarter, cutting waste and bringing down costs are expected to save billions over the next several years. Such savings are expected to come from a number of initiatives, including contract reforms and environmental management programs, implementation of Galvin Task Force recommendations such as reducing excess oversight, and realignment.

The contributions from implementing Galvin Task Force recommendations are expected to be substantial over time but have not yet been quantified. Consideration will be given to incentivizing DOE contractors through rewards for cost reductions over a specific level; and researchers by permitting some portion of program savings to be reinvested in research. The FY 1996 request does include an undistributed $50,000,000 reduction in the Energy Supply Research and Development appropriation. Upon completion of the Galvin Task Force, the Secretary of Energy Advisory Board Task Force on Strategic Research and Development (Yergin Task Force) and the President's Committee of Advisors on Science and Technology reviews, this reduction will be distributed to specific programs. It is anticipated that some portion of the $50,000,000 reduction will be transferred to other appropriations since not all laboratory savings will be realized in the ESR&D appropriation.

Mr. Bevill. The Department seems to be placing much of the future success of its fusion energy program on the International Thermonuclear Experimental Reactor (ITER) and the Tokamak Physics Experiment (TPX). Why do we need both facilities?

Dr. Krebs. The International Thermonuclear Experimental Reactor (ITER) is designed to extend the successful deuterium-tritium experiments in the Tokamak Fusion Test Reactor (TFTR) to controlled ignition and extended burning of a deuterium-tritium plasma. The objectives of the Tokamak Physics Experiment (TPX) are to 1) improve the performance and economic attractiveness of a tokamak power plant, and 2) develop the technology needed for continuous operation of a fusion power plant. Hence, TPX complements ITER, and both are needed to design an economically attractive demonstration power plant.

Moreover, TPX is critical to the U.S.'s ability to participate in and benefit from the ITER program. It would be the principal experimental device in the United States during the decade between the completion of the TFTR program and the beginning of ITER operation. The U.S. industries would be heavily involved in the design and construction of TPX, which would provide them with the expertise to participate fully in the construction of ITER. This is consistent with current U.S. policy which was reviewed and endorsed by the Fusion Policy Advisory Committee and the Secretary of Energy Advisory Board.

Mr. Bevill. What is the relationship between the two?

Dr. Krebs. Work on the International Thermonuclear Experimental Reactor (ITER) began in 1987, when the European Union, Japan, Russia, and the United States agreed to collaborate on the Conceptual Design Activities. A second 6-year agreement to collaborate on the Engineering Design Activities was signed in 1992. Work on the Tokamak Physics Experiment (TPX) began in 1992, when the Secretary of Energy Advisory Board on Energy Research Priorities recommended the termination of the Burning Plasma Experiment and the initiation of a new device designed to study "tokamak improvements that could suggest new operating modes for ITER and permit the design of more reactor-desirable follow-ons to ITER." The TPX was initiated with a mission that is primarily complementary to ITER. However, TPX will provide valuable information on long-pulse operation to ITER and may develop techniques for improved tokamak operation that can be tested in ITER.

Mr. Bevill. ITER is an international collaborative effort. What has been the U.S. funding level over the past two years, what is in the DOE budget for ITER in 1996, and finally, how much have the other participating countries contributed to this program?

Dr. Krebs. The following table provides the requested information.

ITER Funding
(B/A in millions)

FY 1994	FY 1995	FY 1996
$62.7	$70.6	$82.0

The European Union and Japan have provided about the same level of effort as the U.S. has. The Russian Federation has been falling somewhat behind, due to their economic problems; however, the work they do is of high quality, and their participants are making significant contributions.

Mr. Bevill. Please describe the United States' domestic fusion research efforts as they compare to the efforts of other countries?

Dr. Krebs. The basic strategies of the four major fusion programs are very much the same, with differences of emphasis consistent with the strengths and budgets of each program. The programs of the European Union, Japan, Russia and the United States all focus on the tokamak physics program and envision ITER as the next step experiment, followed by a Demonstration Power Plant to produce electrical power. Each also is pursuing the possibility of an international, high flux materials testing facility.

In the European Union, this basic strategy is complemented by a significant program in supporting technologies and a strong program in alternate concepts, including both the stellarator and reversed field pinch and a watching brief on inertial fusion.

In Japan, this basic strategy is complemented by a significant program in technology development and strong support for industry. Japan also maintains a major program in alternate concepts, focused on the Large Helical Device and including a continuing program in inertial fusion.

In Russia, this basic strategy is the focus of the program with complementary elements in technology and alternate concepts severely limited because of the overall financial limitations in science and technology.

In the United States, this basic strategy is complemented by an active program of concept improvement centered on the TPX experiment, very modest programs in supporting technologies and development of innovative concepts, including inertial fusion energy. The U.S. program is constrained and more focussed because of funding limitations relative to the European Union and Japan.

UNIVERSITY AND SCIENCE EDUCATION

Mr. Bevill. Why is it important for the Department of Energy to play a role in our nation's Science Education efforts?

Ms. Rumsey. There are two key reasons why the Department plays an important role in the Science Education efforts of our nation. First, with over 20 national laboratories and facilities, the Department of Energy has the largest scientific research and development system in the world. If offers the expertise and collective genius of our 30,000 scientists and engineers, including 33 Nobel Prize winners. This unique scientific and technical capacity establishes the foundation for the Department to significantly contribute to the national educational goals, and make valuable contributions to math and science education. Our world class facilities and intellectual resources are the basis for increased knowledge, resulting in a real competitive edge for the American people.

Second, a large investment has been made in our national laboratory system over the past 40 years. For an incremental amount of additional funding, these world class facilities are used to provide cutting-edge science and math advancements to students and teachers, as well as producing a well-informed citizenry. It is in the national interest to have a well trained, diverse work force to ensure the Department will be able to meet its future needs for scientists and engineers in support of its missions, and the skills necessary to compete and win in the global marketplace.

DEPARTMENT OF ENERGY/EXPERIMENTAL PROGRAM TO STIMULATE COMPETITIVE RESEARCH (DOE/EPSCoR)

Mr. Bevill. EPSCoR was originally designed and created by the National Science Foundation, partly in response to the desire of this committee, to stimulate better research and increase the ability in states that traditionally have lacked strong university-based research efforts to compete for federal research support. This Subcommittee authorized an EPSCoR program at the DOE in the Energy Policy Act of 1992. Please provide a status report on DOE's EPSCoR program.

Ms. Rumsey. While the Department of Energy's EPSCoR program is relatively new, significant progress has already been achieved. To date, seven of the EPSCoR states have received research implementation awards of up to $1.25 million; 13 have received graduate student traineeship awards that range from $220,000 to $950,000; and all 19 have received planning awards of approximately $100,000.

The FY 1996 budget request for the program is $2.1 million. Subject to a satisfactory progress review, the requested funding will be used to sustain the activities of the three states that began their research implementation programs in FY 1994, albeit at a reduced rate. At this level, no new research implementation awards will be funded in FY 1996.

Already apparent in the EPSCoR states are a variety of infrastructure building activities and interactions that will enhance the ability of these states to better compete for federal research support in the future. Faculty from different universities are, for example, combining their resources to mount larger research efforts, collaborations between the academic community and federal agencies and industrial partners are beginning to form; and the state legislatures and governor's offices are becoming involved in efforts to develop strategic plans to use state resources to support a science and engineering infrastructure within their states.

DOE is also benefitting in a number of ways Because the DOE EPSCoR program has been structured to encourage collaboration between the Department's national laboratories and the academic community, significant outside expertise is being directed toward studying energy-related research questions. Further, as the program places heavy emphasis on the involvement of students in the research activities of the participating faculty and laboratory staff scientists, DOE is developing a talented, diverse future workforce needed to accomplish its mission

Mr Bevill. The Department has developed an implementation plan designed to keep this program highly competitive. Please describe this five-year implementation plan as it was highlighted in OSTP's July report to Congress on the EPSCoR program.

Ms. Rumsey As detailed in the OSTP's July report to Congress, an implementation plan was developed that would result in a robust, highly-competitive EPSCoR program at the Department of Energy As part of this plan, the DOE EPSCoR project proposed to continue its graduate student traineeship support and to initiate a new element to allow the program to develop additional faculty expertise in energy-related sciences As described in the July Report to Congress, the Department suggested the start of a Faculty Enhancement Awards Program that would enable competitively selected faculty to become involved in research programs at the Department's national laboratories. Over the five-year period of the implementation plan, between 20 and 40 such awards would be made. Faculty who participated in this program become the nucleus around which subsequent research implementation applications are developed. Such a program is particularly valuable to those states that have been previously unsuccessful in their attempts to secure a DOE EPSCoR implementation award.

Further, to allow the states to develop the infrastructure and personnel required to sustain nationally-recognized, competitive research programs, the Department envisions providing 9 of the 19 states with research implementation awards of up to $1.25 million a year for 5 years. The one-to-one match of non-Federal resources will continue to be mandatory.

Mr. Bevill. Is the Department's current budget adequate to meet the program's stated goals and objectives as outlined in your implementation plan?

Ms Rumsey The FY 1995 budget of $7 0 million will require downsizing and modification of the goals and objectives outlined in the *Office of Science and Technology Policy Report to the*

United States Congress on the Development and Integration of the Experimental Program to Stimulate Competitive Research, July 1994.

Is this level of support adequate to sustain a healthy, viable EPSCoR program? While we would clearly like to do more for the EPSCoR states, the FY 1995 level of funding would enable us to sustain a viable program in the Department that is providing significant benefit to our EPSCoR partners. We would, however, not be able to fully fund the research implementation awards.

Mr. Bevill. Currently, the DOE's EPSCoR program is administered through the Office of Science Education and Technical Information. Is the DOE EPSCoR program "housed" in the proper organization, one that will result in the maximum benefit for the program?

Ms Rumsey. Yes, it is As directed in the Energy Policy Act of 1992, the DOE/EPSCoR program was to be managed by the Office of University and Science Education Programs, which, at the time, was part of the Office of Energy Research In March, 1993, the Department was reorganized and the programs and staff of the Office of University and Science Education Programs were transferred into the newly created Office of Science Education and Technical Information. Because of the unique dual nature of the DOE/EPSCoR program, one that includes a strong education emphasis, the Office of Science Education and Technical Information utilizes its expertise in building the required infrastructure that will allow the EPSCoR states to develop competitive research programs.

The DOE/EPSCoR program places significant emphasis on developing the EPSCoR states' research infrastructure and on enhancing science, mathematics, engineering and technology education in these states. The research needs and interests of the EPSCoR states are more broad than those supported by the Office of Energy Research The Office of Science Education and Technical Information ensures that its expertise with respect to the EPSCoR program is supplemented by the involvement of a variety of the Department's technical program offices (including the Offices of Defense Programs, Energy Efficiency and Renewables, Energy Research, Environmental Restoration and Waste Management, Fossil Energy, and others).

HUMAN GENOME PROJECT

Mr. Fazio. I am particularly proud of the work of this subcommittee in its efforts to fund and build the Human Genome Program at LBL. The Human Genome Program has been instrumental in speeding the discovery, characterization, and isolation of disease genes. I understand that we have had some real success, especially genes affecting breast cancer, other cancers and genetically influenced diseases. First please explain in layman's terms DOE's Human Genome Program.

Dr. Krebs. The Human Genome Program, which was initiated in the Department of Energy, is a concerted, international, interdisciplinary effort to develop and apply the technologies, biological resources and information-handling tools to characterize the molecular nature of the human genome. Its ultimate goal is to determine the location of the estimated 75,000 human genes and to obtain the complete sequence of the 3 billion chemical subunits that make up the molecular blueprint for a human.

Mr. Fazio. How does the Human Genome Program fit in with DOE's basic mission?

Dr. Krebs. Since World War II the Department and its predecessor agencies (the Atomic Energy Commission and the Energy Research and Development Administration) have had the mission of determining health risks associated with exposure to radiation and energy-related chemicals. In the mid-1980s it became clear that prospective new technology might provide more sensitive measures of mutations in human populations and better risk estimates (at the level of the individual) associated with low-level exposures to environmental agents. Consequently, DOE initiated the Human Genome Program as the best approach to accomplish this long-term Departmental mission.

Mr. Fazio. Did DOE know with any degree of certainty that when it invested in this basic research facility that you would get such impressive results so quickly?

Dr. Krebs. No, we did not. At the time of the initiation of this program, there were many who were very skeptical regarding the possibility of developing cost-effective technology to achieve its goals. The Human Genome Program's rapid success is due to several factors. One of these is the interdisciplinary research capabilities that DOE laboratories have brought, and will continue to bring to bear on complex problems. Important new technologies and biological resources have been developed by the DOE program and disseminated around the world. They have played a central role in the rapid progress achieved by the program. Another important factor is that other countries have developed very large and focused programs that have made major contributions. As the implications of the genome project for medicine and for commercial applications have become better understood, other developed countries have devoted increasing resources in this area. Today, it seems certain that the genome program will achieve its 15-year goal of complete mapping and sequencing of the human genome.

Mr. Fazio. Would this type of break-through medical research likely occur in a purely private laboratory setting?

Dr. Krebs. No, it would not. The private sector is very interested in developing applications of genomic information and in specific subsets of that information. However, there is no commercial incentive to develop the entire map and sequence of the human genome.

Mr. Fazio. How is the research at the Human Genome project integrated with that of NIH? Are there any jointly supported activities?

Dr. Krebs. In the early days of the project, DOE and NIH signed a Memorandum of Understanding that committed the agencies to coordinate and cooperate in conducting the genome program. There are a number of ways in which the two programs conduct a coordinated program. On a practical working level, staff of the two programs are in almost daily contact; they attend the review panels of the other agency so as to track the research programs; senior management frequently meets to discuss and resolve issues; each agency attends the meetings and advisory councils of the other and joint meetings of advisory groups of the two agencies have frequently been held. In addition, the multiyear planning of the U.S. genome program is jointly conducted and published by the two agencies.

There are several jointly supported activities. The two agencies jointly support a newsletter describing the progress and activities of the genome program. The two agencies support a series of workshops devoted to assessing progress of mapping in individual chromosomes. The Genome DataBase at Johns Hopkins University, the world's main repository of human genome mapping information, is jointly supported by DOE and NIH. Several scientists have support from both the DOE and NIH programs. DOE laboratories have transferred automated machinery and informatics software to NIH genome centers. There is a generally facile flow of technology, biological materials, ideas and information between all genome researchers. This flow between DOE-NIH and world-wide genome researchers and managers is facilitated by the immediate connectivity afforded by the Internet. A major joint activity is conducted at the Lawrence Berkeley Laboratory (LBL) and the University of California at Berkeley. NIH is supporting a large project devoted to sequencing the genome of the fruit fly, an important model organism. The sequencing is conducted at LBL and utilizes a DOE-developed sequencing technology bolstered by automated equipment developed at LBL. In this cooperative project, DOE is supporting the technology development and supporting informatics while NIH is supporting the production of sequencing operations.

DEPARTMENT OF ENERGY'S FACILITY INITIATIVE

Mr. Fazio. Research scientists need state of the art facilities to conduct their experiments. At existing facilities, the crucial issue often becomes "operating time" -- how many hours can we run these complex machines?

You mentioned in your opening statement DOE's Strategic Facilities Initiative. This program comes with a large price tag. Can you give the subcommittee a few examples of typical users of these facilities and the type of work they do at these facilities?

Dr. Krebs. The percentage breakdown of users of the BES-supported facilities include about 46% university scientists (chemists, materials scientists, solid state physicists, structural biologists) whose research is supported by the National Science Foundation, the National Institutes of Health and the Department of Defense as well as the Department of Energy; about 13% from U.S. industry in pharmaceuticals, chemicals, electronics; about 26% from federal laboratories (Department of Energy, National Institute of Standards and Technology, National Institutes of Health and United States Geological Survey) in materials science, solid state physics, earth science, chemistry, and structural biology; and about 15% from other institutions.

Following are a few examples.

Dr. Steve Laderman of the Hewlett-Packard Company has developed a technique using synchrotron radiation at the Stanford Synchrotron Radiation Laboratory to detect very minute, contaminant particles that sometimes appear on silicon wafers and cause the fabricated micro-circuits to fail. With this technique, called Total External Reflection X-ray Fluorescence (TXRF), Laderman has demonstrated that the limit of detectability can be extended by two orders of magnitude beyond that of conventional laboratory x-ray sources. This is exceedingly important in the fabrication of the next-generation computer chips which have smaller and smaller features where microscopic amounts of contaminants can have a severe impact in the function of the micro-circuit.

Another example is in the case of Dr. Doon Gibbs of Brookhaven National Laboratory, who has been among the leaders in developing the use of synchrotron radiation to study magnetism in solids. The x-ray beams from these facilities are so intense that even though the magnetic interaction of x-rays with electrons is about 10,000 times weaker than the electric interaction, some very fundamental insights into the electronic structure of solids can now be measured in a unique way. The electronic and magnetic properties of materials are determined by their electronic structure, and it is important to understand this electron structure and how it can be influenced by composition, and crystalline environment in order to design electronic and magnetic materials with superior electronic and magnetic properties. Magnetic materials are used in electric generators and motors and in the information industries for recording media.

A university researcher, Professor Robert Birgeneau from MIT, and his students have carried out neutron scattering experiments at the High Flux Beam Reactor at Brookhaven to measure both the structural and magnetic excitations in the new high temperature superconductors to gain a fundamental understanding of the mechanisms at work in the behavior of these exciting new materials.

These materials are superconducting (no electrical resistance) at temperatures as high as 125K with potential applications in the transmission of electric power, high field magnets for magnetic levitation and accelerators, for storage of electric power, and in numerous others such as detection of geological deposits, data transmission and processing, and laboratory instruments.

Scientists from Northwestern, Du Pont and Dow Chemical Company are working together to build a beam line on the Advanced Photon Source at Argonne National Laboratory. This experimental beam line will use the extremely bright beams of x-rays provided by the APS to study the structure of advanced materials, including polymers during the formation and processing of fibers, and two-dimensional structures such as surfaces, interfaces and thin films. These experiments will yield improved catalysts for chemical processing and improved synthetic fibers used in textiles.

Finally, Dr. Steve Sooner of Oak Ridge National Laboratory has developed a residual stress measurement capability using the intense neutron beam at the High Flux Isotope Reactor. This technique enables scientists to measure the stresses present in a manufactured part and to determine how heat treatments or changes in the manufacturing process can relieve these stresses. If a part is manufactured and in the process, internal stresses are created. This could lead to catastrophic failure (fracture) of the part which could be a gear in an automobile, or a wing strut for an airplane. Dr. Sooner has worked with people from the Saturn Automobile Plant, and other companies, to provide this kind of information.

Mr. Fazio. How do we get the greatest return on the federal investment?

Dr. Krebs. The major BES-supported user facilities have a growing number of users totalling 4,565 in 1994. A 10% increase in operating funds will result in more than a 30% increase in operating time. The additional funds for new instrumentation will increase the effectiveness of existing instruments and provide the capability to do experiments that cannot be done with existing instruments.

The leverage comes in by providing at least twice as much experimental capability for all of these researchers funded by NIH, NSF, DOE, DOD and other sources, as well as those supported by industry.

HIGH ENERGY PHYSICS

Mr Fazio. As you know, this subcommittee annually supported the Superconducting Super Collider, the SSC. We all know that there was little question as to the soundness of the science associated with the SSC. It really became more of a budgetary issue, not a scientific one.

In the wake of the SSC termination, we were left to ponder the future of high energy physics. As you know, the Drell Report recommends a plan for the future of high energy physics in the wake of the termination of the SSC. I think it would be helpful for those Members of the subcommittee who are unfamiliar with the Drell Report to talk about this road map for high energy physics.

In particular, would you explain the Drell Report recommendations and their importance to the United States maintaining its position as the world leader in high energy physics?

Dr. Krebs. The Drell Report outlines a vision and path for the U.S. high energy physics program to follow over the next few years. This vision and path, if it can be followed, will enable the U.S. to maintain its position as a world leader in high energy physics as called for in the Report which states: "As befitting a great nation with a rich and successful history of leadership in science and technology, the United States should continue to be among the leaders in the worldwide pursuit of the answers to fundamental questions of particle physics".

The Report calls for a $50,000,000 increase in funding relative to FY 1995 for three years starting in FY 1996 (inflation adjusted for FY 1996 and beyond), the "Drell Bump". This funding would provide for productive use of existing facilities, completion and operation of their upgrades, adequate support for university-based researchers, significant participation in the LHC project at CERN as specifically recommended by the Report, and an enhanced effort in accelerator R&D. This is a concise description of a program that will allow the US to maintain its position as a world leader in high energy physics.

The Drell Report also recommends that even if the "Drell Bump" is not provided, but a constant level-of-effort budget is provided, the U.S. should still participate in the LHC. Participation in the LHC is necessary for U.S. physicists to remain active at the high energy frontier after the LHC begins operation in the next century, certainly a requirement for a world class program.

Mr. Fazio. What consequences do you see if we fail to follow the Drell Report's recommendations?

Dr. Krebs. The consequences will, of course, depend on how close or far from the recommendations we might be. In general, at funding levels moderately below that recommended in the Drell Report we would see a reduction in the rate of progress in the US program - reduced accelerator running times and reductions in the scope of the university based part of the program, but we would continue to try to become involved in the LHC at a reduced scale.

If the funding level is further reduced by a significant amount, we would have to give serious consideration to terminating facilities and perhaps even shutting down laboratories. The university based part of the program would have to be significantly reduced, and participation in the LHC would probably not be possible.

If there are major cutbacks in the US program and if participation in LHC is not possible, I would expect to see the US position of world leadership in HEP lost.

Mr. Fazio. How would failure to implement the Drell Report recommendations impact current users?

Dr. Krebs. Again, the impact would depend on how severe the failure to implement the recommendations was. In general, since accelerator operating times would decrease, users would see delays in getting experiments scheduled and completed. Both university and laboratory based user groups would face funding reductions, and the support for some users would have to be eliminated. These users would have to find other research to pursue or even other employment.

Mr. Fazio. How do we restore the faith in high energy physics?

Dr. Krebs. It should be remembered that, even without the SSC on the horizon, the U.S. has an excellent set of facilities and a community of well qualified researchers. The Tevatron at Fermilab is, and until the LHC begins operation sometime early in the next millennium, will remain the highest energy facility in the world. It has just discovered the top quark, and I have every expectation that the Tevatron will continue to produce world class results for a long time. Similarly, we have world class capabilities at both SLAC and at the AGS at BNL. In addition, we have under construction and well along the Fermilab Main Injector which will significantly enhance the research capabilities at Fermilab and the B-factory at SLAC which will address one of the key questions in the field of CP violation, which underlies the reason that our universe is made of matter rather than antimatter.

The Drell Subpanel efforts have made a good start toward restoring morale in the community. If it becomes possible to fully, or almost fully, implement the recommendations of the Subpanel Report, I believe that we will have gone a long way toward assuring the vitality and productivity of the field in the U.S.

B-FACTORY

Mr. Fazio. I want to follow up on the line of questioning I pursued with the Secretary regarding the B factory.

As you know, large science projects have become one of the favorite targets for spending cuts. I have been involved in our efforts to reduce spending, but I think those cuts must be made on a principled policy basis, not on some "slash and burn" reaction unrelated to the merits of the individual project. What procedures and systems have you put in place to make sure that construction of the B-factory stays (a) on time and (b) on or under budget?

Dr. Krebs. The construction of the B-factory is a joint collaboration of three laboratories, the Stanford Linear Accelerator Center, Lawrence Berkeley Laboratory, and Lawrence Livermore National Laboratory, led by Stanford Linear Accelerator Center. The Department of Energy, working with the B-factory management team, has put into place a detailed management plan that specifies management structure, relations, and responsibilities for B-factory construction. The working relations between the Stanford Linear Accelerator Center and Lawrence Berkeley Laboratory and Stanford Linear Accelerator Center and Lawrence Livermore National Laboratory are established by formal memoranda of understanding which are updated semiannually to keep abreast of the changing needs of the work. In addition, a formal Project Management Control System (PMCS), based on the Primavera/Cobra commercial software, has been put in place and validated by an independent review team as being fully functional as a cost schedule and management tool for the B-factory project.

Construction progress is monitored by a dedicated on-site DOE management team lead by an experienced project manager with an extensive engineering background and through semiannual technical, cost, schedule and management reviews. Each of these reviews is chaired by DOE and includes specialists on all aspects of project design, construction and management. A particular feature of the semiannual reviews is the use of highly qualified consultants (not DOE staff) who are experienced in the science, technology and construction of other, similar colliding beam facilities for high energy physics.

TUESDAY, MARCH 14, 1995.

SOLAR AND RENEWABLES

WITNESSES

CHRISTINE A. ERVIN, ASSISTANT SECRETARY, ENERGY EFFICIENCY AND RENEWABLE ENERGY

PETER FOX-PENNER, PRINCIPAL DEPUTY ASSISTANT SECRETARY, ENERGY EFFICIENCY AND RENEWABLE ENERGY

KARL R. RABAGO, DEPUTY ASSISTANT SECRETARY, OFFICE OF UTILITY TECHNOLOGIES, ENERGY EFFICIENCY AND RENEWABLE ENERGY

Mr. MYERS. The committee will come to order.

This morning we have solar and renewables, and we are pleased to welcome back Secretary Ervin and your associates, Dr. Fox-Penner and Mr. Rabago. Your prepared statements will be placed in the record and if you would like, proceed as you care.

OPENING STATEMENT

Ms. ERVIN. Good morning. Delighted to be here.

I did want to introduce Dr. Peter Fox-Penner, the Principal Deputy for the Office of Energy Efficiency and Renewable Energy, and Karl Rabago, who is the Deputy Assistant Secretary for Utilities, which represents about two-thirds of the budget before this subcommittee.

Mr. Chairman, Members of the committee, I am pleased to present to you the administration's budget request of $423 million for solar and renewable energy programs in fiscal year 1996. This represents an increase of about 9 percent from last year's appropriation, which, by the way, is the lowest percent increase either requested or received in the last several years, but nevertheless presents you with an opportunity to support a sound investment decision for our Nation's economy. With that support, these programs have and will continue to deliver substantial beneficial returns for today and tomorrow.

In my oral comments this morning, what I would like to do, instead of reviewing the whole budget, is to focus on three policy questions at the core of our budget request? First, why are renewable energy technologies important to the country? Second, why is it necessary and prudent for the Federal Government to play a role in developing and helping deploy these technologies? And then, finally, what is the payoff? What measurable, tangible returns do we provide to the taxpayers for investing a portion of their funds in this work?

Let me briefly address those questions, then.

RENEWABLE ENERGY TECHNOLOGIES

Renewable energy technologies are important because low-cost, reliable and diverse energy resources are critical to the Nation's economy, our industrial competitiveness and to the welfare of Americans. Energy drives the engines of our economic well-being. The typical American family spends more on energy consumption than it does each year on medical care. So by focusing on our vast domestic resources in renewable energy and our technological capabilities, renewable energy investments increase our national security and position us for a more secure economic future.

Today, more than a third of our Gross National Product is related to energy. Although the oil embargoes and technology advancements produced remarkable decreases in the amounts of energy that we have used to produce units of gross national product, those improvements have leveled off in recent years. Today, oil imports account for record highs of over 50 percent of oil consumed and amount to the single largest factor in our national trade deficit, even though prices paid for energy have remained relatively stable or have even declined in real terms since the oil embargoes.

Over the course of this decade, the United States alone is expected to invest as much as $200 billion in new electricity generating capacity just to replace aging power plants and to keep pace with rising demand.

The picture overseas is even more startling. The World Bank estimates that between 1990 and 2000, 600,000 megawatts of new electric generating capacity will be installed worldwide. That represents a total expenditure of about a trillion dollars, roughly $100 billion a year.

The United Nations estimates that more than two million villages worldwide are without electric power for their water supply, refrigeration, lighting and other basic needs.

Shell International Petroleum Company recently issued energy development scenarios to the year 2020. And in their gross scenario, which is their basic scenario that they presented, emerging renewable technologies progress along the learning curve, first capturing niche markets, then gradually expanding and then becoming commercially competitive over the next decades.

In their scenario, by 2020 renewables contribute 20 percent to commercial worldwide energy. This contribution is expected to grow to 32 percent under the Shell projections by 2040 as the technologies mature and diffuse out into the marketplace.

Now the Department of Energy's research and development portfolio developed in partnership with the private sector has positioned the United States to play a leadership role for capturing a healthy share of those markets, if we stay the course over the next few years.

GOVERNMENT'S ROLE IN DEPLOYING RENEWABLE TECHNOLOGY

The second question then asks, why is it necessary for the Federal Government to play a role in developing and deploying those technologies? What does the Federal Government do that the private sector cannot do for itself?

Well, as you well know, the Department of Energy supports world-class research through our national laboratories, universities and private research institutions, so the budget request ensures that this country's basic scientific and technological foundation for energy efficiency and renewable energy development remains the strongest in the world.

But the movement of those technologies out of the laboratories, out of the universities, into the marketplace requires additional investment in applied research, development and deployment of technologies to facilitate, if you will, a rapid return on those embedded costs. For that reason, the 1996 budget request continues to support not just basic and applied research but the full continuum of technology development from the early stages to the point where industry and the markets take over.

We have learned over the years that much basic and applied research is expressly guided by lessons that can only be learned in the deployment context rather than the model of a single pipeline from research to deployment or to commercialization, a linear process, if you will. Our industry partners have impressed upon us that the process is more of a series of overlapping interactive efforts and if we would narrowly focus on just one stage of that process we are likely to be unsuccessful.

As I mentioned, our programs are strongly shaped and guided by continuous and systematic efforts to listen to one of our key customer groups, U.S. industry, including small businesses.

In the last year and in many cases at the express urging of U.S. energy industries, we have supported the formation or the continuation of industry consortia or coordinating councils in the areas of wind, photovoltaics, solar thermal energy, biomass energy, geothermal, hydrogen, superconductivity, electromagnetic field research and others.

The budget request before you with its emphasis on technology advancement and industry partnerships is a direct result of their telling us that this is the best way, the only effective way to ensure return on our investments.

INVESTMENT RETURN

The third and final question is, does our budget request invest the right amount of funding in the right types of programs? Are we going to get the highest possible rate of return on the taxpayer dollar?

We do face real challenges in ensuring that our Nation maintains its competitive leadership of reliable, low-cost energy supplies. Restructuring and the advent of competitive reform in this electric utility industry have led to additional decreases in the previously modest research and development budgets in the utility industry. Just as industry researchers must fully justify their budgets to their chief executives and stockholders, we at the Department of Energy are obligated to Congress and the American people to ensure that investments in these programs are not just defensible but essential, not merely prudent, but profitable.

The budget for these programs, I believe, meets these high standards. It is balanced in scope and approach. It ensures the basic research continues in order to guarantee the required technology base can lead to product improvements by industry. It also reflects the basic market reality that investments in research and development must be recovered and the sooner the better.

ENERGY SAVINGS

Our programs are expected to result in the deployment of nearly 20,000 megawatts of renewable energy generation by the turn of the century here and overseas. That kind of success means long-term, highly skilled jobs for thousands of Americans.

In combination with our efficiency programs, our offices will deliver over $20 billion in energy savings for the Nation each year beginning just five years from now. That is $20 billion in added disposable income for our families, businesses and industries. With such technological capability as a foundation, the U.S. can remain an exporter of security—energy security to the world.

Finally, our renewable energy industries and corresponding Federal programs are evolving into a major national success story. Renewable energy industries, in collaboration with the national labs and the Federal programs, are making substantial progress.

Prices for energy delivered by these technologies have dropped by orders of magnitude from 90 cents per kilowatt hour to 20 cents in 1994 for photovoltaics, and still dropping from 40 cents per kilowatt hour to 5 to 6 cents in 1994 for wind, for geothermal 9 cents to 5 cents. That progress has been made through steady, modest increases in the Federal program budget over the last five years, with some leveling, as I mentioned, in that trend this year.

It is important to emphasize that final point. The success in the renewable energy industries in recent years is directly related to reasonable, multiyear programmatic focus, designed to foster and accelerate the progression of technologies from the laboratory to the marketplace. Now our industries are poised to capture burgeoning domestic and international markets.

Thank you very much. I am happy to be here and to answer any questions you may have.

[The prepared statement of Assistant Secretary Ervin appears at the end of the hearing record.]

SOLAR AND RENEWABLES

Mr. MYERS. Well, thank you, Madam Secretary.

Your closing remarks there were about the competitive position that each of the renewables finds itself in, and that is one thing this committee has been concerned with.

As you know, we have supported all these renewables—solar, wind, geothermal, all the renewables—but I don't know how much longer we are going to be able to do that, quite frankly, in this austere mode we find the Congress and the Nation in. So if you should add back in the cost that we have as taxpayers invested in some of these sources of energy, if you crank that back in, as any business would have to do, then you might change the figures from a nickel to maybe double that.

I don't know if I am right, whether that is the right proportion or not, but what else can we do besides research? Is there anything we can do to make—solar, as an example, is probably one of the most expensive—other than passive, as far as generation is concerned, is very expensive. Is there anything further we can do, in your judgment? We have developed a better photovoltaic cell but we are still not being competitive. What can be done?

Ms. ERVIN. Well, we are becoming very competitive in certain markets. In places all around the country you will find photovoltaics being the least-cost form of energy—for example, off-the-grid remote applications.

That is why a number of utilities all over the country are beginning to build photovoltaics into their system, sometimes to modulate the entire grid system to provide two to three times more of the value with that photovoltaic application than you would at the central power source. So there are opportunities in this country now and certainly overseas that are competitive.

But you are right. We still have to make progress. And the goal with the photovoltaic program, for example, is to halve those costs over the next 10 years.

INTERNATIONAL MARKETS

I think one of the keys, one of the answers to your question is found in one of the areas of increase in the 1996 budget, and that is the international market. The scope of this international market is mind-boggling. You look at the World Bank's estimate of the trillion dollars capacity needed by the end of this decade alone, and that dramatically increases over the next couple of decades. All the analysts say that you will need every form of energy resource available to meet that need.

Let me give you one or two examples because this area is so important. You look at China and India, places where the Secretary has visited on trade missions recently. You have got 50 percent of the world's population in those two countries. If globally you look around the world, about 50 percent of the world's population doesn't have access to electricity right now. There is no way that they can afford or that we can afford to bring traditional electricity or power sources to those populations without renewable resources.

In Chile, for example, you find a country that has a coastline of about a thousand miles, very long, skinny country. The President of that country has promised his people to bring electricity or power to the full rural population by the year 2005. He cannot do it without wind, without PV, without other renewable technologies. They are the least-cost form of improving—dramatically improving the quality of life and the economic stability of these countries.

Now, that is a long introduction, but the bottom line for us is that when we gear up for those large overseas markets we also reap the benefits of building economies of scale into our manufacturing processes here at home. So when we gear up and get those economies of scale, the price is going to go further down, and that is within the near horizon.

SOLAR ENERGY

Mr. MYERS. If you look at the per capita annual income in Chile, as you mentioned here, how are they ever going to pay for whatever source without huge subsidies? Chile has just not been that wealthy that they would be able to support that, either. I don't know what the answer to it is, but the world market is one thing.

But if we can't afford it in this country, how can other countries afford it?

As an example, it would seem to me that some of the islands in the Pacific, American Samoa, as an example, are huge consumers of diesel fuel. Some of those places where they have more sun than we have, what is the story of solar there? Since we are on solar, why haven't they put solar panels in?

A few years ago, in southern California, a lot of hotels were putting cogeneration on their roofs, but I think a lot of that has dropped off because of the tax structure. The tax benefit isn't there. What can be done in some of the territories in the Pacific? Have we advanced solar there?

Mr. RABAGO. I will respond to that, Mr. Chairman.

Actually, you are right. In areas like the Caribbean we find areas that have 99 percent imported energy supplies. In reality, one of the basic facts is the biggest impediment to making the kind of progress you are talking about is the way things have been done before. And so with big investments in conventional-fired facilities and import obligations, the transitions are difficult.

There are some success stories. For example, in the Virgin Islands when Hurricane Hugo wiped out 85 percent of the electric infrastructure on St. Croix, the energy office there, working with our Atlanta support office, specifically started focusing on opportunities to install solar technologies. A solar water heating vendor, whose base was in San Antonio, is now opening up a new manufacturing facility in the Virgin Islands to address that market.

Although the costs are a challenge, it turns out in many cases the costs are not a challenge compared to what has been paid before. With an average family paying $5 or $6 or $10 a month for diesel fuel, it turns out with some creative financing mechanisms such as have been explored in those kinds of places and even in the large effort in Brazil that is mentioned in the longer testimony, it turns out that the costs are more competitive, and when you finish paying off the technology you get fuel-free electricity for the rest of the life of the technology. That can go 30 or 40 years.

So it is a matter of focusing on the opportunity to get the per unit cost down through the economies of manufacturing scale that Secretary Ervin spoke of, and then also constructing intelligent marketing systems by our industries to distribute, if you will, the product to those kinds of applications.

PHOTOVOLTAIC CELL

Mr. MYERS. Is there a lifetime for a photovoltaic cell?

Mr. FOX-PENNER. Yes, they degrade over time, Mr. Chairman.

Mr. MYERS. I presumed they did.

Mr. RABAGO. The old crystallines lose some percentages over the years. You may have seen some that started blue and eventually turned brown and lost some percentages. That is one of the things they are working on, of course, with the thin film kind of technologies.

Mr. MYERS. My car has done that. It is 12 years old.

Mr. RABAGO. But industry has gotten better about that, and cars now have clear coats. Photovoltaics technologies are now using better coatings.

It turns out that one of the problems with the old crystalline cells is that the clear layer on top of the photovoltaic cell is actually what starts changing color, so they are looking at new technologies and thinner films, such as the coating on this, that don't have that potential for darkening and reducing the amount of light.

Mr. MYERS. We have come a long way already.

Ms. ERVIN. Absolutely.

EXECUTIVE SESSION VOTE

Mr. MYERS. Pardon us, we have a little housekeeping procedure we must do right now. Tomorrow we have some classified material, so—Mr. Bevill.

Mr. BEVILL. Mr. Chairman, because the Subcommittee on Energy and Water Development will be dealing with national security and other sensitive matters at its hearings tomorrow, I move that the sessions on March 15, 1995, be held in executive session.

Mr. MYERS. Are there any questions?

Pursuant to the rules, the vote will be by roll call.

The CLERK. Mr. Myers.

Mr. MYERS. Aye.

The CLERK. Mr. Rogers.

[No response.]

The CLERK. Mr. Knollenberg.

Mr. KNOLLENBERG. Aye.

The CLERK. Mr. Riggs.

Mr. RIGGS. Aye.

The CLERK. Mr. Frelinghuysen.

Mr. FRELINGHUYSEN. Aye.

The CLERK. Mr. Bunn.

[No response.]

The CLERK. Mr. Livingston.

[No response.]

The CLERK. Mr. Bevill.

Mr. BEVILL. Aye.

The CLERK. Mr. Fazio.

Mr. FAZIO. Aye.

The CLERK. Mr. Chapman.

[No response.]

The CLERK. Mr. Obey.

[No response.]

Mr. MYERS. A majority being present and all those present voting aye, the motion is passed.

Mr. Bevill, you may continue.

BIOFUELS

Mr. BEVILL. Thank you, Mr. Chairman.

Madam Secretary, I was curious to hear you talk a little about your demonstration here, and I had a feeling maybe you were waiting for somebody to ask you about it.

Ms. ERVIN. About this?

Mr. BEVILL. Yes, do you want to comment on that?

Mr. MYERS. I thought they were going to bring something out.

Ms. ERVIN. I would love to. Actually, Mr. Fox-Penner is most eager to talk about this.

Mr. FOX-PENNER. Thank you, Congressman.

We brought some samples not only of bioethanol, which you can see here produced from the wood chips on the right, progressing through the various stages of processing, but in addition to that liquid fuel we also brought some solid fuel, namely some switch grass and some poplar chips.

The reason we brought these samples—and I will ask someone to pass them around if you would like to handle the merchandise. The reason we brought these is because we have a significant increase this year, one of our two significant increases in the area of what we call bioenergy production.

If I could put this in a little bit of context, we have at the present time in the U.S. a real need to increase rural electric and economic development. Maybe I should give you a moment to—we didn't know these would be so popular. We might have brought more.

Ms. ERVIN. You might explain what that one is in particular.

Mr. FOX-PENNER. Well, on the right—on my right, your left—you see some wood chips which we put in some of our cellulosic digestion units. That is cellulose in the wood.

Mr. BEVILL. Are those poplar wood chips?

Mr. FOX-PENNER. I believe those are poplar. I know those are poplar. But we have digesters, Congressman, that can handle practically every form of waste cellulose, including waste paper, poplar chips, wood chips of all kinds, rice straw, which I know the Congressman is interested in, and many, many forms of cellulose. It takes some adjusting of the kettles and things like that to get it right, but eventually it ends up as the clear bioethanol you see.

Mr. MYERS. Has that been denatured yet?

Mr. FOX-PENNER. I don't believe it has a tax stamp on it, Mr. Chairman.

So in the U.S. we have a situation in rural America where there is a critical development for new crops, new forms of rural economic development. We have about 36 million acres in the conservation reserve program, $2 billion going into that, and at the same time in our budget we have some strong existing efforts in biomass power and bioethanol, biofuels.

Just to ground you in the existing program, we have about a $20 million program in biomass power that really focuses on getting wood chips and other waste fuels into utility boilers, into paper company boilers to produce power all around the U.S. There is about 7,000 megawatts of that, and there is an additional market for that, and we have been supporting that for a number of years.

We also have a lot of work going on in biofuels, as you see there, going from all forms of essentially waste cellulose into ethanol. What we recognize, though, is that both of these efforts, while they are paying off, are really focused on waste fuels, are focused on agricultural crop residues and other crops of that nature.

What we would like to do and what we think is important for the rural economic development, important for the environment, is to try and create an energy crops industry, and that means going from a market in which you have about a million and a half tons of agricultural wastes in a State to 150 million tons by the year 2005 of energy crops grown specifically on energy plantations owned by farmers or owned by paper companies and the like to produce what we think will be jointly electricity and fuels in very modern plants.

To do that, we need better feed stocks. We need to grow these crops more efficiently. So that means agricultural research that we are going to do jointly with USDA. It means better technologies for processing those fuels more cheaply. And that would include both gasifiers to gasify the plants, the kind of digesters that make that, and advanced turbines.

So in our budget you will see increases in these areas really guided towards taking us beyond the waste fuels industry that we have now into an energy crop industry by the year 2005.

Mr. BEVILL. In Alabama, we have a lot of poplar trees, and we also have corn. And we prefer the corn down there.

The first Secretary of Energy was Secretary Jim Schlesinger, and he was testifying here the first time as the first Secretary. This was during the Carter administration when the gasoline lines were forming, and we were all—everybody in the country was getting very concerned about our energy problems, and that is when the Department was created, as you know.

His testimony on the first occasion that I mentioned was that we could add one part of alcohol to nine parts of gasoline, improve the gasoline, clean the carburetor of all the additives, get the carbon out of the motor and get more power and, of course, increase the supply of fuel—of gasoline by 10 percent. And so I asked him—and this is in the record. I said, does that mean that my old clients, the moonshiners I used to represent in court in Alabama, does that mean they are going to get back in business? He says, why certainly. He said, they have the known technology.

So corn was a little more popular than the poplar wood, but, of course, I am glad to see that the poplar wood can be used, too. I think all this is good that we are trying to get more sources of energy. You know, the last figures I have we were importing about eight million barrels of oil a day.

Mr. FOX-PENNER. That is correct, Congressman.

Mr. BEVILL. That makes our Nation vulnerable as long as we are depending on foreign countries, foreign oil, and we are.

Mr. FOX-PENNER. Yes, sir. We agree.

BUDGET TRENDS

Mr. BEVILL. So it is very important.

I just ask this question to any of you that wish to answer it. You know we are shrinking in the Federal budget, and I am a little curious that you would—you are asking for more than you did last year. And I think you certainly touched on that, Madam Secretary, about taking it all the way instead of part of the way, but you may wish to add to that.

If you wish to do that in the record, you may do so; or if you wish to answer now, why are you asking for more money now than you did last year with the shrinking budget?

Ms. ERVIN. The Department, Secretary O'Leary and the administration made some tough budget decisions in allocating where scarce dollars went in this budget environment. We basically are following a trend that has been started over the past five years to invest increasingly in the renewable energy and the efficiency programs because they represent prudent investments for the economy. It is pay now or pay later, and we think investments in these areas are very strong investment for the economy.

Now, in this particular budget it is a 9 percent increase. That is significantly less than the amount requested and received in a couple of the previous years and even last year. It is representing a tapering off but nonetheless an increase in this tough budget environment. We do appreciate that.

What we tried to do in fashioning the budget request was to hold many of the programs constant. In some areas you will find some slight decreases, not only because programs were wrapping up but also as a way to pay for some other new starts in terms of extending programs.

We focused primarily on two areas. One was the bioenergy program that Peter Fox-Penner just described because of the vast potential there, near term and long term, and also in the international area because of these burgeoning trade markets and the opportunities it represents not only for businesses in this country but also to continue that price decrease through the economies of scale. So those are the two major areas of focal increase in this budget.

Mr. BEVILL. Thank you. Thank you, Mr. Chairman.

Mr. MYERS. Thank you, Tom.

Mr. Riggs.

ENERGY DEREGULATION

Mr. RIGGS. Thank you, Mr. Chairman. Good morning to the witnesses and to others in attendance.

You know, the very first question I would like to ask, and it is a little bit outside the realm of your submitted testimony, Ms. Ervin, is how we are doing in the area of energy deregulation? And are you aware of any problems that have cropped up over the last say year or two since the passage of that legislation that has inhibited the ability of alternative energy producers to sell their power and to get their power to the grid?

Ms. ERVIN. Certainly there is a lot going on in the whole area of deregulation, not only with the California proposal but in the Bonneville Power Administration area and across the country. We are watching that very closely.

I would love to talk about it, but I would be remiss not to let Karl Rabago address it since he comes so recently from the Texas PUC and has been following this issue very closely.

Mr. RIGGS. Very good. Mr. Rabago.

Mr. RABAGO. You are right. There is a lot going on, and we are seeing a sea of change in the world of utility regulation, I think a positive direction led, of course, most recently in April by the announcement from California of efforts to move to a more competitive electric utility model.

We are concerned, as that process goes forward, about whether or not the new system will incorporate the kinds of values we have for clean energy and energy that meets the demand that we overwhelmingly hear from the public for renewable and clean energy alternatives and that those policy considerations be incorporated in the new models that are crafted to incorporate those market forces.

Interestingly, one of the things that I am seeing is that the companies that are best postured and most aggressive about moving to competitive models are also those most vocal about pursuing lines of business in the renewable energy industry. I can name Niagara Mohawk for one, Southern California Edison, Central and Southwest Corporation in Texas.

So we feel good about the fact that more competitive utilities, utilities who don't demand or depend on coming to the public utility commissions for their handouts, are looking at renewable energy as a business line. That is why our programs are focused on bringing those people to the table in things like the utility photovoltaic group, the utility wind interest group, having utility partners in superconductivity to allow them to express their views on the direction of a program that gets us out of the business as soon as possible and turns it over to the market.

There have been things going on with the Federal Energy Regulatory Commission in terms of PURPA. We are looking at it. And, in fact, we are going to use the same process of talking to stakeholders as to what does that mean and what is possible PURPA reform or what the actions of the FERC have to do with the markets.

I guess I will sum up by saying that we believe that in a more competitive electric utility world, renewable energy demand will grow, and for that reason we support things like performance-based regulation as a transition mechanism, and we support more competitive electric utility industries as the path for the future.

ALTERNATIVE FUEL POWER

Mr. RIGGS. Do you have any projections in terms of the percentage of total power use of alternative fuels and alternative technology?

Mr. RABAGO. The renewable total nationwide is about 7 percent. I think you can knock off about five of that with hydropower and get down to about 2 percent. Is that about right, Peter?

Mr. FOX-PENNER. Yes, that is correct.

I think the most interesting forecast that we have seen is that the Shell International Group is now estimating—and this is their own private forecast, not our forecast—that 20 percent of the Nation's power could be renewables by 2010 to 2020.

Mr. RIGGS. How does that compare to the percentage—because I believe they factor this in now—the percentage of our total power needs that will be met through conservation efforts?

Mr. FOX-PENNER. That is just on the supply side. We are supplying about a third of our energy relative to 1973 levels today from energy efficiency, but that 20 percent is 20 percent of the total supply.

ALTERNATIVE ENERGY TECHNOLOGIES

Mr. RIGGS. I see. As we look at the different alternative energy technologies, have you prioritized those that you feel are potentially going to be more commercially viable and commercially successful over those that have less commercial potential? Because that would be very helpful in considering your budget request, obviously, to get the opinion of professionals as to which technologies show again the most potential.

Ms. ERVIN. There is not an easy answer to that in terms of this is the highest priority technology. I will give you, though, a couple of insights as to how we approach it.

First of all, it is really important that we work closely with the industry to guide the investments in these areas because we don't want to be in the position of picking winners and losers per se. We also want to look carefully at the portfolio as its moves over time, so we want to make sure that we are making investments with industry in technologies that are paying off in the near term but also the midterm, and also to make sure that we have some investments now that will get us to some longer term requirements such as hydrogen and some of the longer term biomass.

So I would love to explore this with you further in terms of how we rationalize the budget and how we establish priorities in this limited budget environment, but there is not a single silver bullet, if you will, that says this is the one and this isn't.

WIND ENERGY

Mr. RIGGS. Very good. We will make that a standing invitation; and, hopefully, we can meet and discuss that further in the near future.

I am curious, though, just as one hypothetical, why we hear about wind power making a comeback. Why is that?

Ms. ERVIN. Well, wind power is a remarkable success. I mean, we started in 1980. There was less than 100 megawatts. We have got 1,600 megawatts today. The forecast from the industry is perhaps 10,000, lower than that, maybe 4,000, 4,500 directly associated with our program. So they are doing well, and the goal of our program is to get wind power costs down to about four cents a kilowatt hour by the year 2000.

They are also very competitive in certain parts of the country. In about a dozen different States, they are planning or negotiating contracts for projects right now. But there is more to be done. It is a moving target, if you will. We did not suspect that some of the natural gas contracts would be at two-and-a-half and three cents right now, so our competition is moving as well. That is why we need to focus on wind as being part of a portfolio, a diverse energy resource base.

I will summarize by saying, though, that we have got two components of the wind program. One is, we are wrapping up the field tests and validation of the state-of-the-art technology that is now doing well and is penetrating markets here and overseas. And we are working now also on the next generation of wind turbines. It will be about a five-year program, wrapping up in 1999 and 2000, that will bring the turbines down to about four cents.

BIOFUELS ENERGY

Mr. RIGGS. My last question on this round is you talk about the potential of biomass energy. My Congressional District is home to four national forests. The Congressional District adjacent to mine, the district represented by Congressman Herger, is home to nine national forests. Yet the administration, through their option nine Federal forestry policy, permits very little timber sales or timber harvesting on those lands. Are we ignoring or neglecting a potential fuel source or a potential source of timber for biomass energy by not managing these forests? And have you factored in the potential timber yield from these forests into your long-term biomass energy projections?

Mr. FOX-PENNER. I don't think that we are ignoring it with respect to our long-range plans, Congressman, because our primary objective here is to create a self-sustaining energy crop industry on land that can be farmed now, not on national forests. Now, that doesn't mean there may not be some opportunities to use the biomass on the lands that the national forest has, but we are looking at trying to create a new cash crop for foresters and for farmers in the area of four and a half billion dollars a year.

Mr. RIGGS. Well, I am puzzled. The taxpayers of the United States already own these forest lands. The timber is a renewable resource. Why wouldn't we be looking to these Federal forests as, again, a potential source of timber for biomass energy plants?

Mr. FOX-PENNER. It could be a potential source, Congressman, but we are focusing here on economic opportunities for private farmers and foresters.

Mr. RIGGS. Thank you, Mr. Chairman.

Mr. MYERS. Thank you, Frank.

Mr. Fazio.

Mr. FAZIO. Thank you, Mr. Chairman.

I want to welcome all of you here. As you know, I have had a great and long interest in this area and appreciate the work you are doing.

I think we know we are in a very difficult budgetary environment. I heard this morning that there is going to be an effort by the Budget Committee to reduce the Appropriation Committee's spending caps by some $100 billion over the next five years. It is part of an effort along with the savings the Ways and Means Committee will make to fund the tax cuts that are being marked up this morning in that committee. This puts this Department squarely in the sights of budget cutters.

I think you saw Senator Dole's comments the other day, and when you heard Mr. Myers in his opening remarks today, I think you can understand that there are people who think this particular program in the Department needs to come under close scrutiny. And so I want to use what time I have—and I will wait for another round as well—to try to elicit for the record from you the kind of rationale for not only the existence of the Department but for your program.

SOLAR AND RENEWABLE EXPORTS

You began with Mr. Myers talking about exports, and I appreciate the potential market out there. Why are renewables so well suited to exports? You mentioned Chile, but I would like you to put a little bit more on the record about the kind of markets that exist for us and the kind of technologies that are suited for that kind of market, the emerging Third World market. I would like to get some feeling for where the greatest long-term potential for export lies and what kind of recapture the economy can make for this kind of outlay in the Federal budget.

Ms. ERVIN. The World Bank estimate of a trillion dollar investment that I mentioned earlier by the end of 2000 goes up to 14 trillion very rapidly by the year 2010, I believe.

What we are looking at in the world today is rapidly growing countries, rapidly developing economies. We are looking at more and more democratic governments that are eager and anxious and needy of bringing a higher quality of life and some economic stability to these growing populations.

The short answer is they simply do not have the resources, cannot afford with World Bank, with IDB, with any financial institution, they cannot afford to bring conventional power to those populations. The renewable energy technologies are so well suited, and we are so well poised, the timing is perfect to take advantage of their unique characteristics because they can be very small scale.

Let me give a couple of examples.

Secretary O'Leary visited India recently. One of the stops that she made was to bring a simple solar lantern, hundreds of them to a village. There are about a hundred thousand villages in India, by the way, that don't have electricity. They spend a good deal of their time and their resources gathering firewood to burn for power. Most of them have no lights. They burn kerosene for lamps.

SOLAR TECHNOLOGIES

The solar lantern is simply a small light that is powered by PV that immediately provides cheap lighting for a family that didn't have it, extends the daylight hours into the night, allows children to study longer. This is what the people told us in terms of their studying and improving their education, a very simple thing.

You can expand that rapidly to PV panels for houses that are relatively inexpensive as well to provide not only several lights but also to power a radio or to power a television. And then you go to larger projects like solar thermal and wind and geothermal, all of those relatively inexpensive, certainly compared to the conventional alternatives that Karl spoke to and are available quickly. They can be built quickly. They can be put up quickly. They can be made accessible to millions and millions of people very rapidly. That is why there is such a strong economic and social and security interest in reaching those markets as quickly as possible.

Mr. FAZIO. Mr. Fox-Penner.

Mr. FOX-PENNER. Yes, Congressman, just to follow up on Secretary Ervin's point. Just in the two trips that the Secretary made to India and China, she signed more than $2 billion worth of agreements for just renewable technologies, not counting all the other exports, including some energy efficiency exports that she had. She spoke of the $1 trillion market through the year 2000.

Our budget is a minuscule portion of that, and if we can't help our renewables industries get into those markets and get a firm foothold for this country rather than ceding them to our foreign competitors, then we really shouldn't get the money. But we think we can do that.

INTERNATIONAL MARKET COMPETITION

Mr. FAZIO. Let me follow up. What are we doing to help the U.S. industry capture these markets? What kind of competition are we facing in the context of other nations that are developing renewable industries? What do we meet out there in the marketplace and what can we do if the competition is as stiff as I think it is to help bring that about, given our limited budgets?

Ms. ERVIN. The single largest increase that we have in this budget—and we purposely focused on it because of the strategic significance of these investments—is in the international area. We do a number of things.

First of all, the Secretary's trade missions that are supported through our programs and our in-kind staff resources, if you call it, provides access, opens up the governments of these countries, if you will, to many businesses and industries that might not otherwise have access to those governments. Secretary O'Leary, for example, has negotiated deals with a number of governments to change their legislation or their rules or their taxing policies that make our industries able to compete.

Some of our increase is to fund significant increases in the number of prefeasibility studies that are done. This is important because, again, one of the advantages of these projects is that they are smaller in scale. That also means that the transaction costs and the administrative costs of developing financing is much higher proportionately for these kinds of projects.

And you also don't find conventional sources of financing to fund prefeasibility. These are new technologies. A lot of people aren't familiar with them. There is a higher risk associated with them in the conventional lending industry, and so these prefeasibility studies that we are funding help reduce those risks.

We also help package a lot of smaller individual projects into a larger financial package, so we improve the financing that is available.

Another portion of our increase sounds simple, but it is important. It is improving the training that is available to government and industry officials overseas to bring them over here to visit our laboratories or to visit utilities where there are on-the-ground applications or to send our people overseas to explain the technologies and make that information available to them.

Then, in some cases, we actually buy down the costs of the project where there is significant cost sharing, but we actually then move into the process of funding a portion of a project.

All of those things together in terms of providing access to governments, access to financing, access to information, helping improve the institutional framework in those countries makes it viable for our industries to compete.

You are right, sir. Our competition is fierce. We don't want to take that for granted. It was just this last year that the photovoltaic industry in the United States surpassed that of Japan in terms of our shipments overseas, but that was the first time in about a decade, and our competitors are very concerned about that.

We are also very aware that we face steep competition in the wind area, for example, from Germany and Denmark where the government provides significant subsidies with a particular focus to exporting their technologies to these new emerging markets.

Finally, we are positioned well. We are ready to seize those markets. But we need some increase in this 1996 budget to help us do that.

Mr. FAZIO. Thank you. I will wait for the next round.

SOLAR AND RENEWABLE INTERNATIONAL MARKET

Mr. MYERS. Thank you, Vic.

I share your concern about the international program. It is not still clear in my mind. I think you have $29 million, and from what you described here that is kind of an expensive program it seems like. Could you break down for the record where that $29 million is going to go?

Ms. ERVIN. Sure. I would be happy to do that.

Mr. MYERS. If you want to provide it for the record if you don't have it available, you can provide it for the record.

Ms. ERVIN. I will summarize it quickly, then provide details for the record.

Our existing 1995 budget is about nine. And you are right. It is increasing about $20 million to $29. That is the single biggest increase and where we focused a lot of our priority attention in this budget for the various reasons I have outlined.

You remember the CORECT program that we have, which is the interagency program that is the focal point in the United States Government for working with the renewable industries. We are maintaining our pledge to hold those administrative costs associated with that program level. We haven't increased that.

What we have increased, though, are the actual implementation projects stemming from CORECT, the prefeasibility studies in particular, the bundling of projects for financing, the cost share for projects, not only in Latin America—you asked about what our priorities are—not only in the Latin American countries but in the eastern European countries and African countries as well, with particular focus on China and India. And the training as well.

I will provide the rest for the record.

[The information follows:]

MAJOR INITIATIVES IN THE INTERNATIONAL PROGRAM

Major Initiatives

Program	FY 1995	FY 1996	Change
CORECT	$1.9 M	$1.9 M	*NC*
Americas' 21st Century	$3.5 M	$5.0 M	*Replicate Brazil* (+1.5M)
Export Initiative (Asia, Africa, Eastern Europe)	---	$4.7 M	*New markets* (+$4.7 M)
USIJI and Country Studies I	$3.2 M	$14.5 M	*New approach/private partnerships* (+$11.3 M)
Country Studies II	---	$2.0 M	(+$2.0 M)
LDC Training	$0.5 M	$1.0 M	(+$0.5 M)
TOTAL	**$9.1 M**	**$29.2 M**	**+$20.0 M**

Americas' 21st Century (A21) currently implements the CORECT export strategy in Latin America and the Caribbean. Phase I of A21 installed 65 kW of PV modules, mainly for lighting uses. Phase II shipped an additional 111 kW of PV, while adding 40 kW of wind and 100 kW of hybrid systems and broadening the scope of the project to include water pumping, refrigeration and other applications. **With the FY 1996 funding increases, Americas' 21st Century and the New Export Initiative will expand the successful models developed in Brazil into new markets in Latin America, Asia, Eastern Europe and Africa.**

The new FY 1996 funding will significantly increase project development in partnership with the private sector through the U.S. Initiative on Joint Implementation (USIJI). The USIJI encourages public/private partnerships that use U.S. renewable technologies to reduce greenhouse gas emissions. It is a new approach for the Federal government and a natural extension of the current international strategies.

Finally, the **Country Studies program will be expanded to analyze additional countries** and to assist in the critical energy infrastructure stages of targeted developing countries. The program is currently transitioning to a new phase to help countries use the results of the original analysis in concrete ways. **Increased funding in FY 1996 will also increase foreign energy experts' knowledge of the benefits of U.S. technologies.** "Hands on" training for energy decisionmakers and operators worldwide enhances export sales by ensuring that there is a familiarity with U.S renewable energy technologies.

Mr. MYERS. You see the problem we have. It is very difficult for us to justify to the hard-working taxpayer out there that we are spending $29 million here in helping someone else develop an energy source when we are trying to find affordable energy for our children and grandchildren for the future. So it is going to be difficult for us to justify that $20 million increase when we are cutting some of the other—what this committee feels are some of the more important programs that you have had.

Ms. ERVIN. That is what is such a win-win situation about this is. By exporting and opening these markets overseas we are going to reduce the cost of producing that power here domestically as well and help U.S. businesses.

NEVADA TEST SITE

Mr. MYERS. Okay. The Nevada test site for solar demonstration, I guess, can you explain that a little bit to us, please?

Ms. ERVIN. I would be happy to. This is really an exciting development that is really turning into something more than we had ever planned.

About a year and a half ago, we had a couple of issues facing us. One, we had a changing mission for the Nevada test site. We had——

Mr. MYERS. A change of mission?

Ms. ERVIN. A changing of the defense mission at the Nevada test site and, with the loss of several thousand skilled jobs, facilities and land available.

We also had the geographical circumstance of that area having some of the best solar insolation in this country and the world, for that matter.

Third, we had a strong local interest and State interest in investing in technologies that would really boost their economy at this site.

Senator Bryan and I cochaired a task force to look at those issues and see if it amounted to anything that would really be feasible. The group requested expressions of interest to see if utilities and manufacturers would indeed be interested in concentrating some production capacity at the solar enterprise zone, the Nevada test site. The expressions of interest were strong, so we continued with the task force over about six months and concluded with the task force becoming a nonprofit corporation.

Of course, my role ends, and the other Members from the industry and the State take over as a nonprofit corporation. They are going to be issuing some solicitations for proposals.

Already, the prospects are very good. Enron Corporation has entered into a joint venture with Solarex, associated with Amoco. They have announced that they want to produce PV power at five and a half cents per kilowatt hour, and one of the clear site opportunities are here at the Nevada test site. A number of other companies and utilities have expressed tentative plans to build production facilities here. The short term goal is 100 megawatts. The longer term goal is a thousand megawatts.

We think the economies of scale at this site from building PV, solar thermal, and Stirling dish-systems, all of those capabilities, is going to have a significant effect on our solar industry.

Mr. MYERS. If there is any place in the world that has more lights than Las Vegas, I don't know where it is. Would you be able to generate enough electricity to provide for the lights there? If you can, how can you do it when they turn their lights on at night? And I don't think it takes a whole lot of effort, I don't think, to pull that. It is all manually operated, the one-armed bandits out there. I never played the things. At night, that is when all the lights come on. That is when you wouldn't have solar.

Ms. ERVIN. May I follow up for the record?

[The information follows:]

THE SOLAR DEMONSTRATION PROGRAM AT NEVADA TEST SITE

The initial goal for the Solar Enterprise Zone is for 100 MW of solar power. The feasibility study identified a solar resource potential of 10,000 MW. 100 MW of solar power would supply four percent of the summer peak for the city of Las Vegas; i.e. metropolitan Las Vegas including Clark County.

GEOTHERMAL ENERGY

Mr. FOX-PENNER. Mr. Chairman, we will use our geothermal power and the other forms of power at that point.

Mr. MYERS. Las Vegas has geothermal?

Mr. FOX-PENNER. Las Vegas has Reno, Nevada, just north of it.

Mr. MYERS. In Nevada you have geothermal? I didn't know that.

Mr. FOX-PENNER. Absolutely.

Mr. RABAGO. And our programs in geothermal, for example, are designed by advancing the technology to open up broader resources.

For example, if you look at the scale of a household geothermal heat pump, the whole Nation is a potential installation location for household and business and school geothermal heat pumps. By going forward in some of our technologies to recover lower temperature heat for the production of energy, we are able to expand the likely locations for geothermal installation.

The other thing is, also, we are working again in a balanced portfolio of activities.

One of the things we are doing with the solar power tower is using a molten salt. The salt is actually like this, but it operates between 500 degrees and a thousand degrees. It stays melted, but you can take what used to be a peaking power solar plant that just relies on direct sunlight and by using this as an energy carrier and storage medium you can have the sun effectively shine for three hours after it goes down.

So we are looking at those kinds of things as well as other storage technologies that give us that capability to deliver power long into the night.

Mr. MYERS. You have introduced geothermal. That is one of the areas you cut back on, wasn't it? You reduced the research request this year for geothermal, as I recall.

Mr. RABAGO. The total funding for geothermal is down slightly.

Ms. ERVIN. Slightly.

Mr. MYERS. Why was that, then, if this is to complement the solar, use geothermal, why are you asking for less money there? You are asking for, I think, more money in solar.

COMMERCIALIZING TECHNOLOGIES

Ms. ERVIN. It doesn't represent any change in priorities or strategy per se.

A couple of projects in the geothermal budget we are concluding. We think the amount in the 1996 budget is sufficient to carry on good priority work being done not only in discovery of geothermal fields and improvements in drilling but also to carry out the work with the consortia.

Mr. RABAGO. The hot, dry rock facility at Fenton Hill, we said, industry, are you interested in making this commercially viable? If not, this program is going to end. This is a part of listening to the market as to where the best opportunities are for commercializing these technologies. If industry isn't interested, we are not interested in continuing something that they won't belly up to the bar for.

Mr. MYERS. Are there any industries that are interested in solar?

Ms. ERVIN. There is a group called the Utility Photovoltaic Group. It is another one of the solar acronyms which has 85 members. The utility partners are the largest share of UPUG, and they represent two-thirds of the utility market in this country. There is a very strong interest in the utilities for solar and the other renewable resources as well.

Mr. RABAGO. Southern California Edison and Idaho Power, have decided that they want to go into business lines. Idaho Power recently installed a solar unit for Mountain Home Air Force Base that saves the Air Force a fortune because it gives them power for remote radar sites that would have been much more expensive to provide with diesel fuel generators.

Mr. MYERS. They are actually producing electricity for consumption?

Mr. RABAGO. Yes, sir.

Mr. MYERS. That doesn't generate electricity, does it, with a solar panel?

Mr. RABAGO. Yes. This is an example of a thin film photovoltaic.

For example, I have young kids. This is about enough power for a Nintendo Game Boy. Alternatively, you can think of it as 6 volts of power. These kinds of things do generate electricity, and here is the kind of plug. I have run a radio in my office off it by putting it to the window and plugging it into the 6-volt DC jack.

My more parochial interest in something like this is based on my military time, having humped a big radio with batteries. My memories are PRC 77.

Mr. MYERS. Heavyweight.

Mr. RABAGO. We have those in the museums at Fort Knox.

Mr. MYERS. We belong in a museum, I guess.

One last observation. Which one of you has a solar watch on?

Ms. ERVIN. Oh, dear, did we forget?

Mr. MYERS. One of you always used to come in with a solar watch.

Mr. FOX-PENNER. We think we have moved far beyond the toy stage to serious business.

Mr. MYERS. We have to live by our watches.

Mr. Bevill.

COLLABORATIVES AND PARTNERSHIPS

Mr. BEVILL. Thank you, Mr. Chairman.

You touched on this a little bit in your testimony, Madam Secretary. How big a role do collaborations with private industry play in your efforts—it seems that you are working toward that—and what percentage of your total budget is designated for cost-sharing arrangements with the private sector?

Ms. ERVIN. Collaboratives and partnerships with industry are the single most important characteristics defining our programs. For this total budget, more than half of it is directly cost shared with industry. And, of that, the cost share is an average of 50 percent. In some of the programs the industry cost share exceeds that.

For example, with some of the wind programs, the required cost share is 50 percent, but the industry is putting in four to five times the Federal amount with their own investments.

Mr. BEVILL. Do you see that increasing or that participation increasing in the future?

Ms. ERVIN. Yes. When I spoke earlier about this continuum of technology development from basic research all the way to getting the technologies ready for market, a number of factors define that continuum. One is that the relative role of the Federal and private sector changes dramatically.

In the basic and longer term research area, the risk is greater, the potential payoffs are longer term, and it is only fair that the Federal Government absorb a larger share of those costs. So you will find that the Federal Government in some programs pays for 75 percent.

But as that technology progresses and as we enter consortiums with industry to direct our technologies, then the industry cost share goes up dramatically. So by the time we get out of it we are leveraging two to four times the dollars that we are putting into it. That is a very important part of our program because it helps direct where we put the money for these technologies.

That is a dramatic change from some of the programs that we ran in the 1980s. We learned a lot from those programs in the 1980s. In many cases, the Federal Government share was 100 percent. It was not necessarily directed by industry. We were putting up demonstrations of technologies that were not ready for prime time. We have come a long way since then, and now the programs are heavily guided by industry and heavily cost shared. We don't demonstrate the technologies until they are ready for demonstration.

Mr. BEVILL. Thank you, Mr. Chairman.

Mr. MYERS. Mr. Riggs.

CORPORATE WELFARE

Mr. RIGGS. Thank you, Mr. Chairman.

I want to follow up on Mr. Bevill's comments as the distinguished Ranking Member of the subcommittee and ask you—that was a revealing figure when you said that almost 50 percent of your budget was devoted to collaborative partnerships with private industry, but how do you reconcile that with other spokespersons in the administration, for example, Secretary Reich and his comments about corporate welfare?

Is there a certain dissonance in terms of the message that is coming out of the administration when your budget request contemplates this ongoing partnership with private industry on the one hand and he is making repeated public statements regarding corporate welfare and corporate subsidies and on the other hand?

Ms. ERVIN. Let me see if I understand your question.

Mr. RIGGS. I will rephrase the question because that wasn't fair the way I put it. Are certain elements of your budget representative of what he means when he talks about corporate welfare?

Ms. ERVIN. I think the whole discussion of corporate welfare or the discussion that I am more comfortable with—because I don't know how he is defining it, necessarily—is grounded on the notion of industrial policy and should the Federal Government be picking winners and losers? Should we be subsidizing certain corporations for work that they would otherwise have done? Are we helping industries seize a portion of the market that is inappropriate for them to do?

My answer would be a resounding no. We have careful ground rules that we follow to produce technologies, not products, and to help consortia and collaboratives of industries rather than single companies. So I am real interested in this discussion that is going on regarding technology policy, and I am very comfortable with the shape and the direction of our programs with that in mind.

We are told over and over again we need to be more like the private sector. We need to listen to the private sector and borrow a page from their book in terms of becoming more productive.

The private sector is telling us that the world is changing. There is a competitive market that is forcing businesses and industries to invest for near-term profits. So their ability to look longer term is being reduced.

At the same time, they are telling us that the need to get their product quickly into the international marketplace is increasing. Five, 10, 15 years ago it was okay to get a product slowly into the marketplace, and you could get a good share. Now that time period can be as low as six months to a year to 15 months.

So I think we have carefully constructed our partnerships in a way that does not inappropriately favor any one company but helps promote technological advancements in a way that helps them deal with this competitive market.

Mr. RIGGS. I appreciate your answer very much, and I find myself receptive to your answer, but let me also simply point out that as one Member of the subcommittee on the Majority side I do find a certain contradiction or dichotomy between your very understandable explanation in response to my question on the one hand and, again, comments of certain key figures in the administration such as Secretary Reich talking about corporate welfare, which I, frankly, think is a term that he uses in the broadest sense on the other.

I guess we can hold that debate for another day because I want to ask specific questions about your budget.

Ms. ERVIN. I would be happy to follow up with you on that as well.

[The information follows:]

INDUSTRY PARTNERSHIPS

While we cannot speak for Secretary Reich, there are no budget elements in our submission that we would characterize in such fashion. Federal investments to promote technology advancements are investments to maintain or improve the quality of life for the Nation's citizens. This can be measured in the jobs, national revenue, and general standard of living that flow from domestic industry successes in the retention of U.S. and world market share, the capture of new markets, and the replacement of lost markets. Industry is the indispensable "middle man" in the benefit process and our partnerships are one of the more effective ways of working with U.S. firms, both large and small. Our goal is to create nondependencies that continue delivering return to the Nation long after our departure, rather than dependencies such as those that sometimes result from certain forms of traditional welfare.

GEOTHERMAL ENERGY

Mr. RIGGS. By the way, I would pose that same question to Secretary Reich and have in my conversations with him.

The one area in geothermal that does show an increase is an additional $7 million at the top of page nine of your testimony to conduct studies of the pressure decline problems at the Geysers projects. That project is very important to me and Mr. Fazio, and I have got a little background on that particular project as it directly impacts my district.

Let me find out from you what are the problems that are being studied there and also the Geysers, and what is the potential implication for our geothermal program at the Geysers in a general sense? And then I will ask a specific question about the Geysers project that impacts my district.

Ms. ERVIN. I will give a little background. It is certainly an important project.

Back in 1988, I believe it was, we were looking at the Geysers in northern California, of course, as a major geothermal resource and which was producing quite well. In the late 1980s there was a precipitous drop in the production. Since the industry had invested $3.5 billion, there was concern not only for the power, but industry and for nearby residents, and we needed to know scientifically what was going on.

So the geothermal division in my shop and the laboratories worked with various people in the area to investigate what was going on. They found that the resource itself was being depleted rapidly and needed reinjection. They found things that were helpful and will be helpful to the industry as a whole, that there were opportunities to more efficiently use that resource, and an opportunity to drill in areas that were more productive within that basin and leave some of the others alone. So that has led to some important research implications for the geothermal industry as well.

Over the last four years we have invested about $12 million, industry has put in $42 million, and we have come up with a lot of important research findings that are very important. Now we are at the stage where industry and the Lake County government are building a 26-mile pipeline to take effluent from nearby areas and use that to recharge, an example of taking one problem and helping solve a problem somewhere else. We are helping to fund the research design for that, and we have $2 million out of that increase in the 1996 budget to do that.

There are many other sources of funding: from the Federal Government, from State and local government and from industry, to complete the 26-mile pipeline. It is on track. We feel very positive about this.

Mr. RIGGS. I appreciate those comments.

This wastewater—I will certainly let Mr. Fazio speak to the implications for his district, but the wastewater will help replenish the declining steam reservoir up there at the Geysers, which is the world's largest geothermal resource area and produces up to 50 megawatts of additional generating power plants and the Geysers.

We are watching this with a great deal of interest, because the largest municipal wastewater disposal system operator on the other side of the Geysers—this is the system that serves the greater Santa Rosa area in Sonoma County and adjacent communities—is under a zero discharge mandate from the regional and State water quality control boards, and they have to eliminate all discharges into the Russian River in the next few years.

I don't know whether piping wastewater in the other direction up to the Geysers would be a viable alternative, but if this particular project affecting Lake County communities proves out it might be an option that we can put back on the table for reconsideration.

I wanted to make that point, if I could.

BIOFUELS ENERGY

Let me also ask, going back to a question I asked on the first round regarding biofuels energy, you stated that one of the objectives of the biomass power initiative is to improve the social economic condition of rural communities through the establishment of dedicated biomanagement feedstocks power infrastructures, which led to my question about Federal forest lands and whether or not we should be inserting the possibility of biomass power production into our forest management plans. I think perhaps we can hold that question for another day, although I am not going to lose sight of that.

Mr. FOX-PENNER. We would be happy to discuss it with you.

Mr. RIGGS. Does the Department have specific communities in mind or any specific communities that have been chosen for these ventures?

Mr. FOX-PENNER. We do not have any firm commitments but are in the midst of 11 feasibility studies with communities around the country to look at the possibility of these integrated systems. We expect later in the year to get proposals from all 11 and to move forward with as many as we can afford with the good grace of this subcommittee. I can't name the location of all 11, but I know where a few are, and they are scattered around the country looking at a variety of biomass energy systems.

Mr. RIGGS. Did you do this through the Federal Register?

Mr. FOX-PENNER. Absolutely.

[The information follows:]

POTENTIAL SITES FOR INTEGRATED BIOMASS ENERGY FACILITIES

Ten case studies are currently underway to evaluate the near-term opportunities and benefits associated with deploying integrated biomass feedstock production and advanced-technology, energy conversion facilities. (The eleventh participant voluntarily withdrew from the study). The locations being studied through these cost-shared case studies are provided in the following table:

STUDY SITES FOR INTEGRATED BIOMASS ENERGY FACILITIES

Study Team Leader	**Study Site Location**
Chariton Valley RC&D	Chariton Valley, Iowa
Kansas State Board of Agriculture	Jackson County, Kansas
Kenetech Energy Systems, Inc.	Route 2 Corridor in Puerto Rico
Niagara Mohawk Power Corp.	Tully, New York
Northern States Power Co.	Granite Falls, Minnesota
Pacific International Center for High Technology Research(PICHTR)/AMFAC	Lahaina West Maui, Maui County, Hawaii
PICHTR/Amoco	C. Brewer's Ka'a Mill/Island of Hawaii
University of Florida	Southwest Polk County, Florida
Weyerhaeuser Co.	New Bern, North Carolina
Wood Industries Co. (WICO)	Tulare County, California

It is important to note that these ten studies are not the only case studies that are currently underway. Numerous case studies for other locations are being pursued by private sector partnerships without federal cost-sharing, and are likely respondents to the collaborative DOE/USDA "Biomass Power for Rural Development" solicitation that closes May 9, 1995. In fact, there have been over 350 requests for the solicitation to date, thus proving the high level of private sector interest in pursuing integrated biomass energy facilities.

Mr. RIGGS. Thank you very much.

Thank you, Mr. Chairman.

Mr. MYERS. Mr. Fazio.

BIOFUELS ENERGY

Mr. FAZIO. Thank you, Mr. Chairman. I am happy to be serving with Mr. Riggs so we can support some of the same activities in our adjoining districts, but the effluent that we are reinjecting into the Geysers would be otherwise flowing down what is today overflowing Cash Creek into my district. So it is a win-win, and we hope there will be other applications of this injection concept because I think the problem Mr. Riggs mentioned in the western part of his district is typical all over the country. Maybe if we can outside of Las Vegas find opportunities for this sort of thing, it would be a popular way to invest a few dollars relatively.

I wanted to touch on the biofuels issue. One of the areas that is being looked at by NREL is in my district in Gridley, California, where Congressman Herger and I share an interest in the conversion of rice straw for biomass purposes. I am concerned about some of the budget priorities between biomass fuels and biochemical conversion versus efforts in the utility sector area in terms of our ability to do commercialization, which, of course, is what we are hoping to be able to do there.

I would be interested in your comments on this project, which I understand could be easily applied to nearby timber applications as well. It isn't just, I hope, available for one type of biomass. I would be interested in your reaction to the Gridley project.

Ms. ERVIN. We are excited about the Gridley project, and the area that we are dealing with is about 500,000 acres of rice. The method for disposing of the residue in the past has been burning. The California legislature has passed a bill that would ban that burning by the year 2000, and that is a real problem. It is typical of the kinds of challenges that we find with biomass because there is a lot of residue that is going unused and that could be put to good productive use. This is a good example of that.

Our people have been working with the Gridley people and industry, and the latest information that I have is that the Gridley team is submitting a feasibility study very shortly to us.

We did, by the way, invest $1.4 million in that feasibility study rather than the originally planned $1.2 million, and we feel optimistic about the potential for this not only for Gridley but for other applications.

In terms of the mix between fuels and energy per se, let me just say that I think the FY 1996 budget represents a good step forward in better integrating these various resources. One of the consequences of aligning various units in the Department or in my office according to utilities, transportation, and outreach programs, et cetera, is that you sometimes don't talk to each other as much as you should. We saw this in the area of biomass, and Peter has worked with it a lot, in fact.

What we are stressing in this FY 1996 budget is that we want to provide as many alternative uses for these crops as possible. Let's not focus exclusively on electrical power generation. Let's not focus exclusively on alternative fuels or a third alternative such as biochemicals. Let's give farmers and other producers as many choices as possible for the products that they have, whether it be rice, straw, corn or poplar trees. Whatever the residue, let's provide choices for them that is going to ensure a better market.

Mr. FOX-PENNER. Just to add to what Secretary Ervin said. She is right. When we started looking at this area we saw tension that really was pointless between the power part of our budget and the fuels part of our budget, and we went so far as to ask industry whether they really viewed these as separate technological development exercises. And they said, to our surprise, "No, we think in the long run there is going to be a convergence here."

BIOENERGY

That is why we started talking about bioenergy. We are moving towards integrated plants that produce both fuels and power. We went so far as to amend the solicitation that has the 11 integrated biomass facilities all over the country to allow them to produce both liquid fuels and electricity, and response from industry has been very positive. Many of them will be producing, we believe, when they propose to us both fuels.

That means that we should be careful about reading the biomass power part of our budget as exclusively biomass power and vice versa. We think that is the way it should be. We have more work to do, but we are moving towards long-run integration.

BIOMASS FEEDSTOCKS

Mr. FAZIO. At some point, you might want to integrate your line items because you are talking about a broader-based program and the traditional budget format may be a little outdated. I certainly think that is the trend that you are pursuing.

Is there any limitation on the diversity of the feedstocks that we are talking about here? Is that one of the things we are hoping to determine in these 11 pilot projects?

Mr. FOX-PENNER. I am astounded at the number of different cellulosic products that we can put into our cellulosic conversion units. They are doing corn. They are doing wastepaper. They are doing all sorts of kinds of woods, switch grass, rice straw. There is a tremendous variation.

And one of the projects that we have in the biofuels area is this new process development unit or PDU at the National Renewal Energy Laboratory, which is a facility specifically dedicated to allow all sorts of tests on all sorts of different feedstocks. And you can change the dials on the kettles and run tests on a great variety of feedstocks in order to demonstrate the capabilities in many, many markets.

Mr. FAZIO. Could you try to explain why we are suddenly finding it possible to use a lot more of them than we originally thought? For instance, a decade ago the rice industry had given up on its ability to generate power or to produce fuel from its waste products. Now we find we have a technology breakthrough.

Mr. FOX-PENNER. From what little I know as a layman, I don't know if it is a question of an all-of-a-sudden breakthrough as us staying the course and making incremental improvements year after year in the kind of enzymes and process developments that you can bring to bear on this. We had a breakthrough this year in the development of a new genetically engineered enzyme which has an unpronounceable name——

Mr. FAZIO. Don't bother. When they are unpronounceable we are absolutely convinced they will work.

Mr. FOX-PENNER. We are very hopeful and encouraged by this breakthrough. It has the potential to bring us down in cost by 20 percent. It is a question of incremental improvement year after year, and we see that in the future as well.

UTILITY APPLICATIONS

Mr. FAZIO. I know Mr. Myers has been patient with me—I have a couple of other questions. There are some things I wanted to get on the record.

You were asking, Mr. Chairman, about the question of utility applications, and I wanted to volunteer that we have PV–USA in my district, which is a utility scale application of photovoltaics. And it is, again, a collaborative of a lot of private sector utilities all across the country which want to demonstrate the ability to the grid of this form, a variety of forms of photovoltaic technology. And, hopefully, that is going to continue to be, at least for the time being, an approach to bringing the private sector to the table on moving forward in this area.

Are there other things that could be done to improve the willingness of the utility industry to integrate photovoltaics into their game plan? I would be interested in your thoughts about R&D tax credits, capital gains, anything that might work to move the economy in the direction that I know you would like to go in from the standpoint of the other benefits of this form of technology.

Ms. ERVIN. I am turning to Peter because he is the economist of the group.

Mr. FOX-PENNER. Two arms, Mr. Chairman. We think it is very important to keep the utility sector as a full-fledged partner in the development and deployment of renewables. We are not working on or proposing any specific R&D tax credits. They are in a sense a broad brush approach to encouraging investment, and we certainly aren't favoring extremely focused R&D tax credits on particular industries.

What we do feel is most important with the utility industry is keeping its institutions strong, the very institutions that allow it to benefit from deployment of renewables. And the Electric Power Research Institute is a key, multi-hundred-million-dollar investor in this industry that brings utilities together. It has had rough sledding lately, and we certainly have worked very hard within the Department to keep it strong.

Utilities need the support of their State public service commissions to do what most people in every State in this country want utilities to do, which is to move in the direction of environmentally beneficial, cost-effective energy sources. And State policies are very, very important in this area. Those are the areas that we are looking at primarily to keep utilities strong in this area.

As you know, we have an integrated resource planning program that works very closely with the utility sector and public service commissions to work on these things.

Mr. RABAGO. From my perspective as a State commissioner, sometimes it seems like everyone who works for a utility comes from Missouri. They want to work with the technologies. They have to have experience with the technologies and the benefits that those technologies provide to their systems with their particular load patterns and their particular customer demands.

So what you will see as you look at our programs is an effort to give the utilities an opportunity—for example, in the utility photovoltaic group—an opportunity to work with photovoltaics and to share the learning and to determine the value that these installations add to their own systems. That is a critical part to utilities adoption of these alternative technologies.

RENEWABLE ENERGY PRODUCTION INCENTIVE

Mr. FAZIO. I did want to move on to the National Energy Policy Act's REPI program. We have in that context the tax credit in the private energy production sector. You in your budget this year have just $3 million to implement that portion of it which goes to the public side, non-stockholder-owned utility sector. I am wondering if you think this is going to be an adequate amount to continue to provide incentives for solar, wind and geothermal and biomass for that sector of the utility industry, which has been fairly progressive in its willingness to adopt renewals as part of their mix.

Mr. RABAGO. The $3 million does look like a small number, but we have to keep in mind that the REPI program is paid for kilowatt hours of production so it is paid on a post hoc basis. That means that the money is, if you will, in the bank for the year before, and we believe we will have sufficient funds to meet the expectations.

Mr. FAZIO. So we shouldn't attack those unobligated funds for this program, because they are waiting to know what the total will be?

Ms. ERVIN. There is a $7 million carryover that complements the $3 million in the 1996 budget.

Mr. FAZIO. You think that will be sufficient to cover what you see as the potential out there?

Mr. RABAGO. Yes.

SOLAR AND RENEWABLE INDUSTRY

Mr. FAZIO. I want to generally ask about the direction of the program. There are a lot of people in Congress who tend to think of your programs as a little bit on the fringe, maybe regionally based, California, Florida, where the sun shines—at least theoretically, we have noticed recently in California. We thought water wasn't renewable, but we discovered after nine years of drought that it comes in bunches.

The bottom line here is what is, from your perspective, the national base of the renewable industry? This is an element of the energy industry that is not fully appreciated. Who is in it? Where is it based? What kinds of jobs does it produce and what is the national interest in what some think of as a regional industry?

Ms. ERVIN. When you looked at the wind industry in the 1980s you thought of two States, California and Hawaii. Even then you found manufacturing occurring in other parts of the country, but that is where the turbines were being assembled. When there were sharp cutbacks in the early 1980s that had dramatic effects on the renewables industry, and you saw a lot of firms close.

Today we are looking at a very strong, diverse industry. Wind, for example, where you are finding turbines either being assembled or contracts negotiated in more than a dozen States. And that doesn't count all the other States where you are finding the manufacture of those turbines and the various component parts.

Look at the photovoltaic industry as well. You have a similar situation where the supplier industry for photovoltaics consists of over 500 companies, and some are Fortune 500, and there are many small companies, and they are located all over this country. The photovoltaic application assembly is also occurring all over this country.

So you are right. There is a lag between the perception of where renewables are used and where they actually make a difference in the economy.

Mr. FOX-PENNER. There is another fact to add that goes to the reason why it is difficult to answer Mr. Riggs' question about priorities, and that is the beauty of renewables is that they are indigenous to the area, and the different renewables are very strong in different parts of the country. There are parts of the country with strong sun; there are other parts with strong biomass, geothermal in the northwest and midwest and hydro in other places. If you combine these you get a very balanced map of the United States. You have biomass in places, and you have deserts in other places where it is good to build PV.

So in terms of benefits to the people of the country it is indigenous to their area, but the broad renewable resources base is well distributed across the United States and the world.

Mr. FAZIO. Thank you.

PHOTOVOLTAIC ENERGY SYSTEMS

Mr. MYERS. I don't quite understand the discussion of what the mission is in the photovoltaic manufacturing technology project. You say there are more than 50 in the country.

Ms. ERVIN. Which one is that?

Mr. FOX-PENNER. Are you referring to PVMaT, Mr. Chairman?

Mr. MYERS. Yes.

Ms. ERVIN. PVMaT is a collaborative with industry, about a $19 million five-year project. And the specific purpose is to improve the manufacturing process and also to improve the materials but primarily the manufacturing process so that we can scale up to larger and larger applications of PV.

We are in about the fourth year of that, and you will find a slight decrease in the 1996 budget because we are wrapping it up.

I believe Mr. Sklar, who testified before this committee, recently indicated that from his industry's point of view he thinks the program is going to phase out in the next year and a half. It will have accomplished its mission. The goal will have been reached to halve the production costs associated with the manufacture of PV.

Mr. MYERS. You have certainly improved the quality and performance and productivity and efficiency of the cell in the years that we have been on the committee here. But if there are 50 industries manufacturing I wonder if they are in it because they are going to participate in the program or are they in it to sell the photovoltaic cells. Is there a need for this PVMaT program today?

Ms. ERVIN. I think we jointly share with industry that the definition of success is when this program is no longer needed. That is not to say that there will not be some continuing need for manufacturing improvements, technology improvements in the general photovoltaic area over time, but this project was intended to ramp up photovoltaics to get the price down to half, and in doing so these companies won't need our further assistance. It will be easier to come before this subcommittee.

Mr. MYERS. This committee has always supported the research for the cell, but if this is subsidizing industry—someone mentioned corporate welfare—it seems like this is a candidate for a program for criticism. On the Floor somebody will say if there are 50 companies are already producing why do you need to subsidize them. Is that a fair word, subsidy?

Mr. FOX-PENNER. I don't think so. This is a very heavily cost-shared project, but it is directed not at paying them to produce the cells but at developing risky, next-generation manufacturing technologies.

Secretary Ervin said that we have heard and I am sure you have heard from many, many small capital-strapped companies who simply can't move to the next generation of manufacturing technology and get the costs down with conventional financing. They just can't do it. If we help them perfect the manufacturing techniques once and allow it to be transferred to the whole industry, there is a payoff to the American people, and the benefits of that flow right through in the form of lower power costs and more jobs for Americans. They are not only going to keep the money for themselves. It will flow through.

TECHNOLOGY INVESTMENT

Mr. MYERS. Isn't there research being done in-house as well as university research?

Mr. FOX-PENNER. Yes, sir. Research on leading edge forms of cells and things like that with the scientists in the white coats. But PVMaT is about creating machines that can manufacture the cells in volume at low cost. It is very hard to manufacture them—it is one thing to make it up in the lab, and it is another thing to mass produce them. This project is about manufacturing technology that is in EPACT where we were directed to do an advanced manufacturing initiative, and it is the kind of investment in technology that keeps industry strong in the future.

Ms. ERVIN. This is a perfect example of the kind of application where you have improvements that benefit the industry as a whole.

I actually had a conversation about three or four weeks ago with a firm that has done considerable research in photovoltaics. They were looking to expand the research. They were looking at, evidently, a five- to 10-year planning horizon for their own milestones that they wanted to achieve.

This may sound like a put-up, but this gentleman told me this is the most satisfactory experience we have ever had working with the Federal Government. Not only has it been beneficial and we learned a lot in the exchange between their scientists and ours, but the results of PVMaT resulted in their exceeding their own milestones by about four years. So they were delighted with it, and at the same time their companies and industries benefit from the exchange that we had through PVMaT.

Mr. FAZIO. Would you yield?

This is similar to what happened in the semiconductor industry where SEMATECH that the DOD helped underwrite was put in a position to help move American manufacturing technology to a point where we could compete. We are always most effective in designing chips but couldn't compete with the Japanese in production to a point where we could turn them into commodities and make money. So I think we have an analogy on a much less costly scale that perhaps that is important to learn from.

Mr. RABAGO. I will echo that.

In the sense of responding to the issue of the welfare thing, welfare as it is usually maligned induces dependence. These kinds of programs like PVMaT are intended to induce independence. What we are trying to do is move these companies to where they are operating profitable lines of business by helping them solve industry-wide manufacturing problems for a technology that is a manufactured technology. So it is a logical step in moving them out of a line where they are reaching for a handout from government.

Mr. MYERS. I don't how much each of the 50 firms are producing, but for the record could you provide how much and what percentage of their manufacture we are subsidizing?

[The information follows:]

PHOTOVOLTAIC MANUFACTURING TECHNOLOGY PROJECT

The PVMaT Project is a government/industry partnership in photovoltaic (PV) manufacturing research and development (R&D) designed to keep the emerging U.S. photovoltaic industry in a world leadership position in a rapidly-growing, high-technology market area. The U.S.photovoltaic industry leads the world in research, development, and product sales; but, government and industrial competitors from Japan and Europe are working hard to leapfrog U.S. technology. The PVMaT project is designed to assist the U.S. PV industry in retaining and enhancing its world commercial leadership in this rapidly-growing, high-potential technology. During the past five years, more than two-thirds of the U.S. industry's rapidly-growing annual sales of cell and module products has been to overseas buyers (exports).

All of the PVMaT contracts require substantial cost-sharing by the PV companies involved, and have been applied exclusively to research and development of new or improved manufacturing methods, processes, and equipment. None of the PVMaT funding has been used to finance additions to commercial manufacturing lines.

The PVMaT Project was initiated in 1990 to help the U.S. PV industry improve manufacturing processes and equipment, accelerate manufacturing cost reductions for PV modules, increase product performance and reliability, and enhance the investment opportunities for substantial scale-ups of U.S.-based PV module manufacturing plant capacities. All of the PVMaT contracts have been developed through open competitive procurements and involve substantial cost-sharing by the companies (an average of more than 40% for all of the contracts). Each contract involves specific R&D tasks developed jointly by DOE/Laboratory and company scientists and engineers under the procurement guidelines and the company's proposal.

The project is now in its fourth and final phase of competitive procurements with about ten fourth-phase contracts now being negotiated. The completion of the PVMaT project is scheduled for 1998. Phase 1 involved 22 U.S. PV companies in small three-month projects (less than $50,000 each in the 1990-1 period) to establish the status, problems, and needs of the industry. Phase 2 has involved seven companies in the Phase 2A procurement (1991-4) and 4 companies in the Phase 2B procurement (1994-7) to work on process-specific manufacturing R&D problems identified by each company as a critical element in improving the performance and reducing the cost of future module products. Phase 3 resulted in two R&D contracts addressing module manufacturing problems common to most of the PV industry (e.g., encapsulation materials and automation of process equipment). PVMaT Phase 4 contracts are now being negotiated on product-driven manufacturing R&D on specific system problems important to improved total system performance and cost reduction of electrical energy produced.

There are currently 25 U.S. companies in some stage of manufacturing of photovoltaic cells and modules or planning toward the manufacture of them. Eight of these companies sell commercially-available photovoltaic cells and modules (at least several hundred kilowatts of modules annually). More than one-half of these 25 companies are still in the manufacturing development stage, most working on thin-film manufacturing technologies. Three of the companies produce small amounts of cell and module products for space applications.

In summary, the U.S. photovoltaic industry currently consists of the following groups of companies:

- Eight companies that manufacture cells and modules commercially--The largest manufacturer sold 12 megawatts in 1994 and the smallest about 0.2 megawatts. More than 80% of the manufactured products were based upon crystalline silicon technology.

  (Seven of these companies have won and completed DOE three-year, cost-shared contracts in a competitive procurement, and have achieved dramatic advances in module manufacturing processes, performance, cost-reduction, and reliability.)

- Seven companies that produce pilot-line quantities of cells and modules for manufacturing development and for selected deployment to evaluate performance and reliability during environmental and inhouse testing. These companies are all developing new technologies and planning on commercial modules sales within the next one or two years.

  (Four of these companies have won and are working on similar DOE cost-shared contracts obtained in later competitive procurements, and are making rapid advances.)

- Seven companies that are in advanced R&D and pilot production planning to produce cells and modules for evaluation and testing. These companies are developing new or improved technologies and products for manufacture in the next two to three years.

  (One of these companies has worked very successfully on a PVMaT contract)

- Three companies that manufacture small quantities of very specialized cells and modules for space and satellite deployment.

  (None of these companies has responded to a PVMaT procurement)

Beyond the above PV cell and module manufacturing companies (current and planning), there are a number of companies that purchase PV cells and modules and incorporate them into their own modules, systems, and proprietary products for sale to dealers and distributors. Finally, there are a very large number of companies (system houses and distributors) that buy and sell products and design and install systems for their customers. The development of this commercial technology is creating thousands of new high-skill jobs in the United States.

WIND ENERGY SYSTEMS

Mr. MYERS. Now wind. There is nothing new about wind. It has been here longer than we have.

I remember on the farm we had a windmill, pumped water, and later they got a Delco system which produced electricity when the wind was blowing.

This committee has been up and down that windmill also. We helped start one in South Carolina, a huge windmill that people within 15 miles hated us because it made too much noise. In Hawaii, we had a similar boondoggle. We had Walnut Hills in California. Last time I flew over it about half were working.

Is it a success where we are producing electricity today from wind?

Mr. RABAGO. There are at least four States with working wind farms, I understand, now. There is one going in Texas. There is 1,600 megawatts primarily in California.

Ms. ERVIN. Twelve different States are either building or the private sector is building.

Mr. MYERS. You are not subsidizing them other than the research?

Ms. ERVIN. That is right.

Mr. MYERS. Original research tells them how to——

Ms. ERVIN. You are right. The story that I talked about earlier—I think wind is a good example of how far we have come in such a short period of time. In the 1980s and 1970s we were dealing with wind turbines that were designed for airplanes, and the reliability was low, and they were noisy, and they broke down, and the Federal Government was footing a large part of the bill.

Now you look at a totally transformed industry where they are close to being competitive in many markets. The turbines themselves, the noise level, their reliability and efficiency has improved dramatically. That is a real success story we can all be proud of.

Mr. MYERS. Some of the entrepreneurs in my area—one fellow showed me how proud he was. He put a windmill up and put a Chrysler alternator, and he ran everything except his electric stove off of it. I went by a year later, and it was down. I said what happened. He said I couldn't keep it up. Every time we had a wind it blew down.

I know there are always problems associated with it. I bought a farm years ago, and it had a chemical process. In the yard there was a tank, and you had to put acid in every so often—it was piped into the house and you lit—it was a coal gas.

Mr. RABAGO. Liquid carbonic kind of thing?

Mr. MYERS. Something like that. You added water to it, and it would produce for about a week.

Mr. RABAGO. That is what they used to do in the miners' helmets.

BIOMASS POWER INITIATIVE

Mr. MYERS. That was carbide. This wasn't a carbide system. I wore one of those one time just long enough to get out of that place.

I am concerned about biomass. Biofuels have been discussed here. I am concerned about the biomass power initiative.

A number of communities around the country have been burning their garbage, but I have one community west of Indianapolis which is burying its garbage. They put clay over the top, and they have two generators running off the methane without Federal help as far as I know. Public Service Indiana is a cooperative with it. Why do we need the power initiative?

Mr. FOX-PENNER. If we could back up for a moment. We give technical assistance to a number of landfills, and EPA does, too, that are using methane to generate power. We think it is an environmentally beneficial and economically beneficial way to get power, and it is funded by this subcommittee, and we appreciate that.

Mr. MYERS. The power initiative—I know the research that has gone into it—why do we need the power initiative?

Mr. FOX-PENNER. The biomass power initiative is part and parcel of this attempt to address what we see as a missed opportunity for creating a new rural economic opportunity in the U.S. If we could improve the technology, which we think we can do by 2005, farmers and foresters could plant energy crops on lands that now lay fallow and on which the Federal Government pays farmers not to produce, we could make liquid fuels and power without subsidy and sell them back to the local refiners and to the power plant. That is why we want to do this initiative.

Mr. MYERS. Maybe I misunderstood about the biomass power initiative. I thought that was assistance to the communities to use it. This isn't research, as far as I understand. I thought it was an initiative to get them to produce more from biomass.

Mr. FOX-PENNER. Part of it is to convince utilities and other boiler users to co-fire their present streams of coal and other things to add some biomass in to get some experience with it. But most of the dollars are for research and development, including demonstration.

As Deputy Assistant Secretary Rabago mentioned, utility people need to see plants demonstrated before they will believe the technology is real. What the biomass power initiative does in these 11 studies we have going is to do demonstrations of leading-edge technologies, new kinds of gasifiers, new kinds of advanced turbines to demonstrate that you can actually get to power from biomass that is four cents and competes with power from gas turbines.

Ms. ERVIN. Let me say for the record that I think we all want to stop using the word initiative. We have used it in the terminology to describe this, but it is very similar to what we are doing in the wind program. We are doing field testing and demonstrating of state-of-the-art technology in wind. And in our budget we are also moving into the next generation of terms because we have to keep getting the price down and technology improved.

The same thing that we are doing with the biomass initiative as well. A number of the solicitations and the collaboratives that we have in place are to deal with residues, the rice straw and poplar trees, using economic ways to use those for power or for ethanol or for biochemicals.

But the future, the next generation of biomass, is going to have improved feedstocks, grown specifically for those uses and improved turbines that are much more efficient and capable of handling that biomass.

ADVANCED TURBINES FOR BIOMASS

Part of this effort, for example, includes work in the fossils energy program to temper the turbines themselves, scale them for biomass so they are smaller and harden them to deal with the corrosive effects of the biomass material. So it is a combination of improved technology in turbines, improved feedstocks and then putting that on the ground with utilities and other users to integrate the whole system.

Mr. MYERS. This committee has always supported biomass and biofuels, but I wish the Federal Government would be consistent.

I have cement manufacturing in my district. A few years ago they found all these tires so they chopped them up and started blending in a heat process to manufacture cement. They soon got taken out of that business so they found liquid waste they were able to burn mixed with fossil fuel. Now they are taken out of that business.

It has to be destroyed someplace, but they can't make a product from it. I wish the Federal government would get consistent. I agree, but we have to try to get rid of the waste somehow. Yet when we try to manufacture with it we say to the consumer, the Federal government says you can't burn it here. You can't burn it here and manufacture a product with it which makes no sense. I hope under things we passed last week we can stop some of that foolishness.

Mr. FAZIO. It was an EPA regulation?

ALTERNATIVE FUELS RESEARCH

Mr. MYERS. Yes. I don't think it was your fault. You would have heard from me before now if it was.

Ethanol, there is nothing to do about ethanol either. Tom tells the story of drinking alcohol, and it is kind of a shame to put good alcohol in a fuel tank.

Mr. FOX-PENNER. You know the saying about ethanol: They drink the best and burn the rest.

Mr. MYERS. Maybe we should have some research on that, committee research. But what about ethanol research? Is there any way we can make ethanol competitive so we can burn more alcohol?

Ms. ERVIN. I will speak a bit about that——

Mr. MYERS. Soy diesel, which is popular. A couple of co-ops in Indiana are doing that now.

Ms. ERVIN. The alternative fuels program in the Department is very important for the reasons that you have talked about and that we have talked about this morning.

Very few Americans understand, I think, that our oil import level is at an all-time high, and it is growing. It is about 40 percent of our entire trade deficit. We have just got to become aggressive in developing some alternative fuels.

Mr. MYERS. Do we consider Alaska oil as imported because it has to be shipped down to us? Is that part of the 50 percent?

Mr. FOX-PENNER. There is a statistical anomaly in EIA data, but that doesn't change the fact that you have around 50 percent whether you count that or not.

Mr. MYERS. We import more Alaska oil than that, don't we?

Mr. FOX-PENNER. Yes, but it doesn't change the numbers. Percentage terms, half our oil is coming from abroad. And it is heading towards 60, 70, 80 percent.

Ms. ERVIN. The ethanol portion is a critical part of that fuel mix, and that is why we have put extra effort into this biomass program. The costs are coming down. The unpronounceable bacterium that Peter referred to is really promising. NREL, the National Renewable Laboratory, deserves to be very proud of this breakthrough.

We have heard on the efficiency side about the sulphur lamp. That is a dramatic breakthrough in technology. This is the counterpart for ethanol because it means a dramatic change in the efficiency of turning sugar into fuel.

So the laboratory people there believe that this development is going to have a significant effect on bringing the ethanol costs down to a very good level.

Mr. FOX-PENNER. This is ethanol here, and it used to cost $3.60 a gallon 10 years ago to make it from cellulosic feedstocks. Now it costs $1.22 in our laboratories. And if we can get it down to 60 cents—we have already come down a factor of three—down to 60 cents, you can put it in your car at that point.

Mr. MYERS. You could afford to drink it then.

Mr. FOX-PENNER. You could make a special exception now and then.

That is the name of the game, cost reductions from cellulosic feedstocks. And one of the ways to bring the cost down is the waste product that comes off this looks awful good in a gasifier to make electric power, and there you have the coproduction.

Mr. MYERS. How about soy diesel?

Mr. FOX-PENNER. We continue to research soy diesel. We are not sure that it has quite the scale-up opportunity that this cellulosic energy crop industry will have in the long run, but we are continuing to fund and look at it in this budget. And in this budget we have some interesting new projects going in that area.

ELECTRIC MAGNETIC FIELDS

Mr. MYERS. The study on electromagnetic field effects—you have asked for less money this year. Are we satisfied there is no such thing as high tension, high wire, high voltage—

Ms. ERVIN. The 1996 budget reflects a slight decrease in the EMF budget primarily because of an accounting mechanism of keeping track of the matching funds that we have. This is the RAPID program authorized by EPACT, a five-year program, $65 million total, 50/50 cost shared. And to keep the program on track we will need to ask for a slight increase for fiscal year 1997. But it is a very successful program.

Why I am very pleased about it is that it is specifically designed to provide pragmatic results and findings on whether or not exposure to these fields presents a health risk.

I have heard people say: is this a black hole? Are we going to keep pouring money into it and will we ever have scientific findings?

That is the beauty of the RAPID program that EPACT authorized. It says, let's take five years, work together—DOE with the National Institutes of Health, EPA and the utility industry, other researchers involved—take the best of the science, look at the literature, do risk assessments and come to some findings and develop recommendations for mitigation if necessary.

Mr. MYERS. How much longer is that going to take?

Ms. ERVIN. This is the second year of the program I believe.

Mr. RABAGO. The last year of funding under the EPACT program is 1998. It was authorized and appropriated a year later.

Mr. MYERS. Seems like we should be able—we have no hint now whether it is a risk or not?

Mr. RABAGO. We have a lot of disparate unconnected studies. Some that say there is a risk, and some that say there isn't.

We are applying the credibility of the Federal Government in its laboratories and research institutions to specifically answer that question. If we don't answer that question, we will at least characterize the risk as best we can.

It is a critical issue, though, because there is perception driving a lot of that behavior. I will reach back to my days as a commissioner. A lot of intervenors come in saying we don't want this power line.

We are not going to have a fully electrified, wonderful world of technology if we don't get the electricity. We are focusing on doing things that haven't been done before, replicated studies, doing exactly the same thing to see whether or not the effects change so that we can have valid scientific evidence to drive our decision-making regarding EMF as opposed to perceptions and fears.

HYDROGEN POWER

Mr. MYERS. We run into this all the time. Our mail indicates various dangers. What we are doing, we are doing very well. We have shook it up and caused these problems.

I recall when I wired the house. They said, my God, I wouldn't put electricity in that house. There are kids around. You don't know what it is going to do to those children. Back then the old-timers thought it was terrible. They were going to continue to use Alladin's lamps, kerosene lamps.

My last question—hydrogen. This committee had high hopes about the hydrogen engine, hydrogen power, future automobiles, the power of hydrogen packs. What happened? Where did they fall off the track?

Mr. RABAGO. We are still working on it. We believe we agree with the Hydrogen Technical Advisory Panel that there is a significant future role for hydrogen.

However, much research needs to be done. This is still very much a basic kind of research program because, again, the competition is a constantly moving target. Prices for energy generally have fallen or at least stayed constant.

Hydrogen faces significant technological challenges. We have to have storage mechanisms, production mechanisms and then end-use applications that can use it effectively. We have a hydrogen program that right now is around $7 million, I believe, in the budget request. And it, again, works in concert with the Hydrogen Technical Advisory Panel to identify the best kind of work we can do. Right now we are focusing on using hydrogen from a reforming process from natural gas so that we have the fuel available that we can start using in some end-use applications.

Your colleague, Chairman Walker is a strong proponent of a hydrogen future and has introduced independent legislation on that. We have been having discussions with him and his staff and will continue to work with Congress on the proper shaping of a hydrogen research program that will lead us to that future.

Mr. MYERS. Well, authorization is easy. I used to be on authorizing committees. It is very easy. But when you have to put the dollars up there, people start asking you questions. Why did you put the dollars in there when we haven't seen a hydrogen engine yet?

Mr. RABAGO. Yes, sir.

Mr. MYERS. This is one of the problems we run into. We are all believers in research, but every once in a while you have to have something to show the taxpayers where their dollars went.

Mr. RABAGO. This one is a little bit difficult.

One of the things we emphasize when we talk about the hydrogen program is we actually have synergies going in a lot of areas. We have some areas looking at fuel cell technology in buildings and in vehicles that ultimately, we believe, will be able to run on hydrogen, so that if we develop these technologies today with today's conventional fuels or slightly reformed conventional fuels, we believe we will lay the essential groundwork so that the future of hydrogen can become a reality.

But you are very much right. Our industries face the same kinds of pressures.

Ms. ERVIN. You raise an important point, too, because we have a decrease in this budget for this line item for hydrogen, and there have been questions raised about that. I want to stress the synergies discussion because there are programs in other areas that complement this, and we believe that this is a sufficient amount to carry out a good program on hydrogen.

HYDROPOWER

Mr. MYERS. My last question—I always ask it every year—two things. First, in water, hydropower, we have huge rivers that flow very fast. Why do we have to have the high dam to generate electricity? Why can't we just put the weight of the water and the flow of the water turning a turbine?

Mr. FOX-PENNER. You can, Mr. Chairman.

Mr. MYERS. Why haven't we done it? Why do we have to build a high dam? That is always objectionable.

Mr. FOX-PENNER. We don't have to.

Ms. ERVIN. I think the trend in this country certainly has been to low head dams, the much smaller dams.

Mr. MYERS. It isn't lower than what I am talking about, no dam at all.

Ms. ERVIN. The high, large-scale dams were put in quite a few years ago. And you are right. They certainly have created lots of problems. That is why I hope in this country and certainly overseas there is a trend towards the smaller-scale projects that create less impact.

Mr. MYERS. Well, going back again, my old days, the mills back in Indiana used to grind—grist mills they called them. They weren't all high water wheels. A lot of them have the undershot, turn the wheel from below instead of above. I don't know why we can't generate electricity the same way. I can't imagine why we have to build a dam of any sort.

Mr. RABAGO. In reality, that is one of the most interesting markets overseas. Countries like India and Pakistan are looking at microhydro.

Mr. MYERS. Is that what you call it, microhydro?

Mr. RABAGO. Yes. They do exactly that kind of activity.

Mr. MYERS. I can say that word. You can't say yours. You couldn't, either, though, so——

Mr. FOX-PENNER. Right.

UTILIZING NUCLEAR WASTE FOR HOME HEATING

Mr. MYERS [continuing]. And you had it in your pocket, too.

Then the last one, of course, that always bothers me. We have tons upon tons of nuclear waste, and every once in a while I bring in a little button that said that amount of electricity would heat a house, a home for four, for all year. Why can't we utilize that nuclear waste for heat of homes? Why can't we manufacture, contain that and put it in your nuclear furnace and generate heat instead of dissipating all that——

Ms. ERVIN. Perhaps that is a question I should have referred to colleagues elsewhere in the Department.

Mr. MYERS. That is what they say, too.

Mr. RABAGO. Hopefully, they are not pointing to us, Mr. Chairman.

Mr. MYERS. That is not exactly a renewable, but it is, too, in a way. You are always going to be producing waste. I have to find somebody some day who will listen to me, I guess.

Well, each of us have questions that we would provide for the record.

We appreciate your testimony today, Secretary Ervin, and each of your colleagues.

Ms. ERVIN. Certainly. It was a pleasure.

Mr. MYERS. Thank you very much. The committee will stand adjourned until 2:00 this afternoon.

[The prepared statement of Assistant Secretary Ervin and the questions and answers for the record follow:]

GENERAL

Mr. Myers. Your statement notes that costs per kilowatt hour for wind and geothermal have dropped to five cents. Isn't that now within the competitive market range? Why is DOE continuing to support these technologies?

Mrs. Ervin. These costs hold true for electricity derived from the most favorable resource sites serendipitiously located near major demand centers, or near transmission facilities serving such centers, and represent a small fraction of the total energy that ultimately can be extracted from these renewable sources. If their energy contribution were to be limited to only this narrow range of facilities, there would be little reason to pursue national programs to develop more advanced technologies. Ocean thermal energy conversion, tidal energy, and wave energy are 3 examples of programs terminated after examination of numerous technical variants showed that total energy contribution would be low. In contrast, wind and geothermal offer enormous potential for meeting both US and worldwide electricity needs. To realize this potential, we need to enhance our current technology in order to be able to utilize less optimum resources -- a reachable objective. For example, in wind we need to improve energy capture in lower velocity average winds, to reduce the effects of fatigue and vibration on operating lifetimes, and to increase conversion efficiencies. For geothermal, we need to use more effectively liquid brine (in lieu of steam) sources, to learn to manage such reservoirs for sustained output, and to reduce the large fraction of total costs required for drilling in the less optimum reservoirs.

Mr. Myers. What is the current market share of each renewable technology, both domestic and international?

Mrs. Ervin. In domestic renewable energy markets, US based companies have about 50% of the wind market, about 75% of the bioelectric market, about 90% of the photovoltaic market, and 100% of the geothermal market. Internationally, US based firms have captured about 10% of the market in wind, very little in bioelectricity, about 40% in PV, and 60% in geothermal. For all practical purposes, there is currently no discernable market in solar thermal electric systems. We do not track hydro market activity and do not have market share information for this area.

Mr. Myers. What is the market share objective for the years 2000 and 2010?

Mrs. Ervin. Domestically, U.S. based manufacturers should install 75% of wind and bioelectric systems in 2000 and 2010, 90% of solar thermal and photovoltaic systems, and 100% of geothermal systems. Internationally, for these same 2 time periods, U.S. wind companies should gain 25-30% of the market, and PV, solar thermal, bioelectric and geothermal companies should capture 40-50%. There is projected to be significant growth in installed capacity between 2000 and 2010 and, while the market share percentages may show little variation from the beginning to the end of the period, the number of megawatts produced and shipped by U.S. based companies will, in most cases, reflect 10-fold or more increases.

Mr. Myers. What is the current cost per kilowatt-hour of each renewable technology?

Mrs. Ervin. The newest wind machines at higher quality resource sites can produce electricity in the 5-6 cents/kilowatt-hour range. At more moderate resource sites -- where far larger quantities of wind energy await to be tapped -- delivered energy wind costs with today's wind turbines may be 8-10 cents/kilowatt-hour. Depending on local conditions, Photovoltaic costs are in the 20-30 cents/kilowatt-hour range, and parabolic trough solar thermal costs are in the 8-10 cents/kilowatt-hour range. At selected sites, current geothermal systems can produce electricity for 5-6 cents/kilowatt-hour. Similarly, low cost bio-residues may be converted to electricity for 6-8 cents/kilowatt-hour. Hydro, where it is available, may be in the 2-3 cent/kilowatt-hour range, and even as low as 1 cent/kilowatt-hour.

Mr. Myers. What is the projected cost of each for the years 2000 and 2010?

Mrs. Ervin. As indicated in our individual program objectives, wind energy costs for moderate wind resource sites are anticipated to be 4-5 cents/kilowatt-hour by 2000 and 3 cents in 2010. PV costs should drop to 12 cents then to 6 cents/kilowatt-hour and solar thermal to 7-8 cents then to 6 cents/kilowatt-hour. Using the more widespread, but less optimum, lower temperature higher brine resources, geothermal costs should be 5-7 cents/kilowatt-hour in 2000 and 3 cents in 2010. Bioelectricity from dedicated resources should cost 6 cents/kilowatt-hour and 4 cents/kilowatt hour in 2000 and 2010, respectively.

Mr. Myers. For each renewable technology, what technical breakthroughs will be necessary to meet the year 2000 market and cost goals?

Mrs. Ervin. Steady technological progress, rather than breakthroughs, will achieve the stated cost goals. The most critical step for wind is to incorporate the latest technology in rotor blades, air foils, variable speed controls, weight reduction, and tower construction into next generation machines. This effort is beginning this year with several cost shared design and fabrication projects and should be completed in 1998 or 1999. The PV industry needs to translate laboratory efficiency gains for thin film technologies into production line output without performance dropoff or manufacturing cost adders. Several program areas address this problem, including PVMat. The high temperature of the working fluid in solar thermal systems limits performance lifetimes; efforts in materials, heat exchanger design, and hot spot control need to be continued. For bioelectric systems, the corrosiveness of some residues in combusted biomass erodes downstream components making hot gas cleanup in the primary requirement, with 2 major projects in progress. For geothermal, drilling is the largest component of system costs and several program activities are underway to reduce these costs.

Mr. Myers. What are the obstacles for these technologies to become competitive with the fossil fuels and other energy sources?

Mrs. Ervin. Cost of delivered energy is the primary barrier that impedes greater penetration of renewables. While renewable electricity output costs have exhibited remarkable steady reductions over the past decade and new gains are continuing to be made, recent price declines in competing fuels, particularly natural gas, threaten to slow the adoption of renewable systems. The danger is that energy decisions, based primarily on today's cost structure, could prove shortsighted if future fuel price fluctuations gravitate upward and render regions of the Nation poorly positioned for energy services. Renewables, of course, are largely independent of fuel price changes and serve as a hedge against energy price instability. The eroding of State public utility commission influence as utilities move toward a more competitive environment diminishes the impact of one of the current forces encouraging a balanced mix of generating sources that enhances U.S. energy security. Other issues include higher front end costs for some renewables (even though life cycle costs may be lower) and chicken/egg problems in reaching productions volumes that can result in lower system costs.

SOLAR AND RENEWABLE TECHNOLOGIES

Mr. Myers: Solar and renewable technologies may not be cost competitive on a straight resource basis, but if externalities are taken into consideration, they could be more competitive. What is the Department doing to develop methods to evaluate cost and benefits to allow better comparison among energy resource alternatives?

Ms. Ervin: We are researching methods to include externalities in cost calculations through a variety of methods including total fuel cycle costs and benefits in scenarios for planning and benefits estimation for major fuels. We are co-funding and working with our partners in the renewable energy supply sector to apply full cost and benefit methods in renewable fuels and integrated resource planning, particularly in demand side management.

Mr. Myers: Of the total budget for solar and renewable energy, how much will be allocated to cost-sharing arrangements with industry?

Ms. Ervin: Of the total budget of $458.5 million for solar and renewable energy, approximately $225.2 million will be allocated to cost-sharing arrangements with industry.

Mr. Myers: On the average, how much is industry contributing to these joint ventures?

Ms. Ervin: On the average, industry is contributing approximately $286.3 million, which is in addition to the $458.8 million which DOE is funding.

Mr. Myers. The largest increase in the budget is for international programs. What will be involved in these initiatives?

Mrs. Ervin. The requested budget increase will support initiatives which are geared to increase exports of renewable energy technologies worldwide through the development of strategic markets, public/private partnerships and by increasing commercial financing resources for major foreign purchases of U.S. renewable energy products. These initiative will play a critical role in helping U.S. manufacturers capitalize on the rapidly expanding market for renewable energy technologies which could reach $100-$150 billion in the lesser developed countries alone. By increasing renewable energy exports, the program creates U.S. jobs, makes U.S. business more competitive and reduces pollution from traditional energy sources.

Mr. Myers. What specific international markets will be targeted?

Mrs. Ervin. The markets targeted are in four major geographic areas: Latin American and Caribbean, Asia, Southern Africa, and Eastern Europe and the Former Soviet Union.

Mr. Myers. Why is the focus on the international community instead of domestic?

Mrs. Ervin. The greatest growth potential for the U.S. renewable industry exists within the international community. Indeed, the photovoltaic industry currently exports between 60% to 70% of its production capacity. The geothermal and hydro industries anticipate that at least 50% of their future sales will be in the export market.

Mr. Myers; What level of funding does the Department provide to each renewable energy trade association? Provide a breakdown of funding for each association in fiscal years 1994, 1995, and 1996.

Ms. Ervin: The attached table provides the level of funding that the Department provides to each renewable energy trade association in fiscal years 1994, 1995, and 1996.

Mr. Myers: What services are performed with this funding?

Ms. Ervin: The Solar and Renewable Energy Programs are primarily composed of a broad array of relatively small-scale applied research activities which are integrated into comprehensive research portfolios to achieve maximum results with minimum resources. A large portion of the Solar and Renewable Energy Program is conducted by small businesses. The Solar and Renewable Energy Programs use the trade associations in five main areas: (1) development of certification and international standards (especially important after passage of the GATT treaty), (2) development of technical publications, workshops, and conferences; (3) providing an interface to industry for critical review of the Programs; (4) providing an interface to industry and electric utilities (the potential purchasers of the products that could result from the Program's research) on the end-user collaboratives now underway; and (5) providing an neutral interface to industry for the Program's competitive field validation procurements. We have found the trade associations provide a neutral, fast, accurate, and cheaper method to provide industry input and guidance, thus ensuring that the Program's research efforts cost-effectively meet market as well as taxpayer requirements. The trade associations provide valuable links to industry.

The attached table provides more specific informatin on the services that are performed by the trade associations with this funding.

DEPARTMENT OF ENERGY
FY 1996 CONGRESSIONAL BUDGET REQUEST
RENEWABLE ENERGY PROGRAMS
TRADE ASSOCIATIONS
(dollars in thousands)

TRADE ASSOCIATION NAME	FY 1994	FY 1995	FY 1996	DESCRIPTION OF SERVICES
BUILDINGS SECTOR				
Solar Energy Industries Association	$244	$244	$244	Industry Representative in Utility/Energy Science Technology Deployment Activities & Collaborative Market Coordination/Public Outreach Activities.
TOTAL	**$244**	**$244**	**$244**	
INDUSTRY SECTOR				
Solar Energy Industries Association	$114	$180	$170	Solar process heat market analysis and identification, development of communication documents (catalogue of projects, brochures), determine opportunities for solar heat in health care and agriculture.
TOTAL	**$114**	**$180**	**$170**	
TRANSPORTATION SECTOR				
American Corn Growers Association	$75	$ 25	$0	Analyses of farm issues
National Corn Growers Association	$ 0	$ 83	$0	Cost-share ethanol research project
TOTAL	**$75**	**$108**	**$0**	

DEPARTMENT OF ENERGY
FY 1996 CONGRESSIONAL BUDGET REQUEST
RENEWABLE ENERGY PROGRAMS
TRADE ASSOCIATIONS
(dollars in thousands)

TRADE ASSOCIATION NAME	FY 1994	FY 1995	FY 1996	DESCRIPTION OF SERVICES
UTILITY SECTOR				
Solar Energy Industries Association	$275	$689	TBD	Publications, workshops, conferences, stakeholder research
National Biomass Industries Assoc.	42	0	TBD	Publications, workshops, conferences, stakeholder research
American Wind Energy Association	703	700	$700	Technical and information support to the U.S. wind industry; development of wind industry consensus standards
Geothermal Energy Association (GEA)	250	350	350	Planning for and organizing energy partnerships involving utilities, the geothermal industry and DOE: creation of interfaces with the States, to transfer geothermal information; preparation of geothermal educational materials aimed at the general public
Geothermal Resources Council (GRC)	100	100	100	Technology transfer activities; creation of an on-line technical database of geothermal technical reports; preparation of the GRC Annual Meeting Proceedings
National Hydrogen Association	100	150	150	Technical Analysis, market assessment, and demonstration linkages for Hydrogen demonstration Plan.
SEIA from DOE/PV Division	600	500	500	Industry status, directory, coordination
National Rural Electric Cooperative Association (NRECA)	0	420	TBD	Technical assistance to small public power utilities implementing integrated resource planning.
TOTAL	**$2,070**	**$2,489**	**$1,800+**	
TECHNICAL AND FINANCIAL ASSISTANCE				
ECRE (funding goes thru NREL)	$905	$1,000	$1,000	Project identification and development
TOTAL	**$905**	**$1,000**	**$1,000**	

Mr. Myers: Please identify each contract your organization has with public relations firms. Identify the company, the amount of the contract, and provide a brief description of the services.

Ms. Ervin: EE has a contract with Macro/Sloan (a partnership between Macro International, Inc., and Sloan Marketing). Through a subcontract managed by Argonne National Laboratory, Macro/Sloan's support has been enlisted to provide public relations assistance to the EPACT Section 405 Public Information Program. The work responds to specific EPACT requirements and assists in the development of focused public information activities in direct support of the Transportation Technologies alternative fuels program. The subcontract supplements capabilities absent at Argonne and has four major components: (1) provide advice on fine-tuning the long-range program development plan; (2) develop distribution channels for the information materials produced by the Section 405 program; convene specialized workshops aimed at niche audiences; and (4) develop and execute measures of effectiveness of the program, and where feasible, of affiliated alternative fuels programs within the Office of Transportation Technologies. A one-year contract was awarded in FY 1995 with the obligation of $100,000 and an option to issue subcontract renewals in FY 1996 and FY 1997. The amount of the contract for FY 1996 has not been determined yet.

SOLAR ENERGY

Mr. Myers. Funds are included in the budget to evaluate the use of the Nevada Test Site as a solar Enterprise Zone. What applications are being investigated?

Mrs. Ervin. The 1992 Defense Authorization Bill directed the Secretary of Energy to evaluate the potential for converting the Nevada Test Site to a facility to produce electricity from solar energy. The feasibility study found that it is indeed possible for the Nevada Test Site to host solar generation facilities. A portion of the $3 million made available by the Office of Worker and Community Transition will go toward project feasibility studies.

The technologies that are being considered for application include photovoltaics, both flat plate and concentrator, parabolic troughs, and dish/Stirling and molten salt power tower systems.

Mr. Myers. Will this be a joint venture with private industry?

Mrs. Ervin. This project will be a joint venture between the State of Nevada, the Federal Government, foundations and private industry. The Federal Government's investment of $3 million is the seed money that will trigger much greater investment from the State through Industrial Revenue Bonds, foundations and private developers. The government's initial investment will help establish a sustained private sector activity that will aggressively pursue commercialization of solar technologies.

Mr. Myers. What commitments are expected from the Department for this venture?

Mrs. Ervin. The Department of Energy's anticipated commitment to the Solar Enterprise Zone 100 MW project is $3 million in Worker and Community Transition funds, land at no cost to industry and purchase of the electricity produced at market rates for use at federal and other facilities. Site preparation costs are expected to be minimal and depend on the private sector's responses to the Request for Proposal. Under the current commitment for 100 MW of solar power the Solar Enterprise Zone project only requires DOE to provide land at no cost to industry and purchase of the electricity produced at market rates.

Mr. Myers. Why is it necessary to provide additional funds to market renewable technologies that were supposed to have been developed for the commercial market in the first place?

Mrs. Ervin. Virtually all Federal investments in research and development are made on the presumption that private entities will eventually use some form of the resultant technology in commercial applications. Investments in the renewable energy area are no different. The Department is complementing its technology efforts with increased emphasis on deployment activities to give U.S. firms a greater opportunity to gain experience and use research results in commercial products and systems and to maximize return on the Federal investment among U.S. based companies. Commerce in current energy commodities and equipment is globally driven. Renewable systems are already feeling the effects of international competition and our attention to deployment is expected to help position U.S. firms to compete more effectively for domestic markets, to capture appropriate shares of world markets, and to shorten the time required for commercialization to occur.

Mr. Myers. Does the need to now fund marketing strategies indicate a flaw in the way the Department has analyzed the U.S. market and conducted research on these technologies?

Mrs. Ervin. No. The federal program is responding to the private sector message that they need hands-on experience with renewables before they can make major commitments to the technologies. If there is a flaw in the U.S. research-to-commercialization process, it is most likely in the recurring failure to capitalize on U.S. technology advances gained through research and development investments, ceding such opportunities to foreign competitors. The program's deployment activities strike at the heart of this weakness. They also serve as a powerful stimulus to U.S. energy industry decisionmaking, catalyzing attention to and earlier investment in commercialization opportunities.

Mr. Myers. Provide an update on the Photovoltaic Manufacturing Technology Project (PVMaT).

Mrs. Ervin. The PVMaT Project is a government/industry partnership in photovoltaic (PV) manufacturing research and development (R&D) designed to keep the emerging U.S. photovoltaic industry in a world leadership position in a rapidly-growing, high-technology market area. U.S. photovoltaic technology and industry leads the world in research and in product development and sales; but, government and industrial competitors from Japan and Europe are working hard to establish their companies in the technology. This project is designed to assist the U.S. PV industry in retaining and enhancing its world commercial leadership in this rapidly-growing, high-potential world electricity-generation technology.

The objectives of PVMaT are to help U.S. industry improve photovoltaic manufacturing processes and products, accelerate PV manufacturing cost reduction and lay the foundation for significantly increased production capacity, thus ensuring that the U.S. industry retains a world leadership role in the commercial development and manufacture of PV systems. It is the goal of PVMaT to reduce the production costs by a factor of 2 to 3 during the lifetime of the program and to simultaneously improve the available product both in performance and reliability. The U.S. industry over the past five years has annually exported more than two-thirds of its product, and has achieved world leadership in this rapidly-growing technology.

The PVMaT project has been implemented in four phases with the fourth-phase contracts now being negotiated. The completion of the PVMaT contracts is scheduled for 1998. Phase 1 involved 22 U.S. PV companies in small three-month projects (less than $50,000 each in the 1990-1 period) to establish the status, problems, and needs of the industry. Phase 2 has involved seven companies in the Phase 2A procurement (1991-4) and 4 companies in the Phase 2B procurement (1994-7) to work on process-specific manufacturing R&D problems identified by each company as a critical element in improving the performance and reducing the cost of future module products. Phase 3 resulted in two R&D contracts addressing module manufacturing problems common to most of the PV industry (e.g., encapsulation materials and automation of process equipment). PVMaT Phase 4 contracts are now being negotiated on product-driven manufacturing R&D on specific system problems important to improved total system performance and cost reduction of electrical energy produced.

Generally, the PVMaT Project has been highly successful in assisting the U.S. PV industry in extending its competitive position through improved manufacturing processes (deposition of thin film materials, silicon crystal growth and wafering, encapsulation methods and materials, automation of processing equipment, etc.); improved efficiencies of commercial cells and modules by 25 to 50%; lower cost and higher quality semiconductor materials (alternative materials and processes, reduced crystal and polycrystalline material defects, etc.); improved quality and reliability of cells and modules; and, improved quality control and safety in the manufacture and use of cell and module products.

Dramatic reductions in the cost of production have been documented by the project's participants.

Mr. Myers. When will this effort be completed?

Mrs. Ervin. PVMaT funding will be completed with FY 1997 appropriations. The PVMaT contracts and final reports will be completed in FY 1998 and early FY 1999.

Mr. Myers: What are the market barriers for the use of photovoltaic technology?

Mrs. Ervin. The major market barrier for photovoltaic systems is high cost compared to conventional energy sources. Current costs for electricity from a photovoltaic system range from $0.20 to $0.30 per kilowatt hour. Although the costs have been reduced by a factor of five over the past ten years, they must be reduced by a factor of two or more before photovoltaics will penetrate the utility market on a large scale.

Mr. Myers: What is being done to address these barriers?

Mrs. Ervin: The Photovoltaic Research Program's main goals to address market barriers are to reduce manufacturing costs to allow electricity production at $0.06 to $0.10 per kilowatt hour, increase module efficiencies to greater than 15%, and increase the reliability of PV cells, modules and balance-of-system components from a current 20-year warranty to 30 years or more. An aggressive, balanced effort in fundamental research, manufacturing engineering and market development is being conducted to accomplish these goals. Silicon and polycrystalline silicon research focuses on advanced manufacturing processes and simplified designs to lower costs. Thin-film research emphasizes conversion efficiency improvements, multiple-junction deposition techniques, improved materials handling, and encapsulation. System development activities will continue to validate PV technologies in highly leveraged projects with industry and utility partners.

Mr. Myers: What progress has been made to date?

Mrs. Ervin: The cost of photovoltaic modules has dropped dramatically in the last decade, from $8.00/Wp in 1985 to under $4.00/Wp today. The continual improvement in cost competitiveness has permitted PV systems to enter markets for many rural, off-grid applications. The efficiencies of all types of PV cells have steadily increased as a result of research and development by both industry and government laboratories over the past decade. For example, commercially available single-crystal silicon modules have increased from 10% to 13% and flat-plate thin film modules have increased from 5% to 10%. As a result, U.S. PV industry now leads the world in production and sales. The PV industry has been growing at a compound rate of about 15% annually, a record that few high-technology industries have been able to equal or sustain.

Mr. Myers. What is the status of the full-scale testing of the 10 MW Solar Two Plant?

Mrs. Ervin. Construction of the Solar Two Project is actively underway as part of Phase IV. It is on time and within budget. While construction is now approximately 50% complete, this phase is scheduled for completion by the end FY 1995. Following project construction, the formal Test and Evaluation Phase will commence in January 1996.

Mr. Myers. Have any utilities indicated interested in this project?

Mrs. Ervin. There is strong utility interest in this project, as is indicated by the number of participating utility partners (see below) in the Solar Two consortium. The utility consortium has formed a Commercialization Advisory Board to formulate plans for future projects.

SOLAR TWO PROJECT PARTNERS:

Utilities
Southern California Edison (SCE)
Los Angeles Department of Water and Power (LADWP)
Idaho Power
PacifiCorp
Sacramento Municipal Utility District (SMUD)
Arizona Public Service
Salt River Project
Nevada Power

Industry/Institutional Partners
California Energy Commission
Electric Power Research Institute
South Coast Air Quality Management District
Bechtel
Rockwell

Mr. Myers. How much is in the FY 1996 budget for the Thin Film Partnership Program?

Mrs. Ervin. The FY 1996 budget requests $18 million for the Thin Film Partnership Program. The FY 1996 request is an increase of $1 million from the FY 1995 funding for this program.

Mr. Myers. What are planned activities to support this budget request?

Mrs. Ervin. Thin film PV modules have unique potential cost advantages over existing PV products. Their development is generally considered the most probable path to truly low-cost PV-generated electricity. As such, Federally funded work in thin films is the centerpiece of the DOE PV research and technology development program. Yet the development of thin film PV hinges on resolving crucial technical issues. In many cases, lab-scale thin film technologies have shown clear promise of reaching the levels of performance, cost, and stability needed for PV to achieve ambitious cost goals. The Thin Film Partnership Program is designed to accelerate new technology development and transfer these advancements to U.S. companies capable of moving the products to the marketplace.

FY 1996 funding will provide second-year funding for contracts initiated in FY 1995. The DOE's National Renewable Energy laboratory is currently negotiating multi-year contracts with 11 companies and universities. Contracts were awarded to technology partners and research and development (R&D) partners. Technology partners are companies likely to move new products to the marketplace, while R&D partners are those performing ongoing research that affects long-term progress.

Annual funding for each partner will range from approximately $200,000 to $300,000 for universities and $500,000 to $1.1 million for companies. Awardees will contribute matching funds equivalent to 10 to 50 percent of contract value.

Mr. Myers. Recognizing the critical role played by universities in developing new technologies and in training manpower needed in the photovoltaic industry, how many Centers of Excellence in Photovoltaic Research and Technology does the Department sponsor at U.S. universities ?

Mrs. Ervin. The DOE photovoltaics division sponsors two centers of excellence. One is at the Georgia Institute of Technology (Atlanta, Georgia) in the School of Electrical and Computer Engineering. This organization is called the University Center of Excellence in Photovoltaics for Research and Education. This Center focuses on advanced techniques in crystalline silicon device fabrication, and processing safety issues. The other is at the University of Delaware in Newark, Delaware. The organization is called the Institute for Energy Conversion. This Center focuses on polycrystalline thin film device development and processing. Both Centers serve as major training facilities for the next generation of photovoltaic scientists and engineers.

TRANSPORTATION BIOMASS FUELS

Mr. Myers. How much is included in the FY 1996 budget for the short rotation wood crops program?

Mrs. Ervin. DOE has requested $6.339 million in FY 1996 for energy crop development. This is an increase of $1.889 million over the FY 1995 level. About $1.0 million is dedicated to herbaceous (switchgrass) genetics development, with the rest supporting short rotation wood crops. Over one-half of the increased funding is to expand support for crop development centers, all of which include short rotation crops. About $0.8 million will be used to support an industrial partnership to develop equipment systems for mechanizing short rotation wood crop systems.

Mr. Myers. Does the FY 1996 budget provide for any additional contribution by the Department for the cost-shared biomass plant located in Sacramento Valley, California?

Mrs. Ervin. Working with the Gridley team during FY 1995, DOE is supporting the development of a feasibility study for the rice straw-to-ethanol pilot plant in the Sacramento Valley. In late FY 1995 or early FY 1996, the new process development unit at the National Renewable Energy Laboratory will be made available, on a cost-shared basis, to the Gridley project to conduct rice straw evaluations. Assuming that positive results come from these studies and evaluations, the Gridley project should be in a good position to compete for demonstration project funds under the Rural Energy and Agricultural Initiative which will begin in FY 1996.

SOLAR ENERGY

Mr. Myers. Describe the program of using sunlight to breakdown toxic wastes.

Mrs. Ervin. The process by which solar energy destroys hazardous chemicals has been dramatically improved since 1990, with gains in efficiency resulting in a factor of four decrease in cost. Improvements have resulted primarily from catalyst development and the design of chemical reactors. Ongoing laboratory tests have demonstrated additional catalyst improvements that could result in another factor of two to four cost reduction. The detoxification process has been tested on a number of chemicals, nearly all of which have been found susceptible to solar destruction. These tests are establishing the breadth of applicability of the process. Program emphasis will start to change in FY96 from process development to determining its applicability to specific industrial markets. This will include obtaining samples of waste streams from industry, determining the effectiveness of the process on them, and configuring chemical reactors for their applications.

Mr. Myers. What type of industry interest is there in this project (using sunlight to breakdown toxic wastes)?

Mrs. Ervin. Although this is a new process, it has already generated a considerable amount of interest (and cost-sharing) from industry. DOE has a cooperative research and development agreement with International Technology Corp to develop reactors that destroy hazardous chemicals in air streams. Cost-shared programs are also underway with Solar Kinetics and SolarChem Environmental to develop the process for destroying hazardous chemicals in water. Each of these companies is planning on commercializing the technology. The success of laboratory and field experiments has spawned optimism that the first applications of the process, which will be powered by either sunlight or UV lamps, will be commercialized in 1996. The program has also started working with potential users of the technology. Cooperative programs have been initiated with the electronic industry (SEMATECH and Intel) and the dry cleaning industry (International Fabricare Inst. which represents 12,000 dry cleaners) to solve air emission problems.

Mr. Myers. How is this program coordinated with the Department's environmental cleanup technology development program?

Mrs. Ervin. A solar detoxification field test was cost shared with DOE's Office of Environmental Management (EM). This project was instrumental in the selection of solar detoxification for an R&D 100 award as one of the 100 most technologically significant products of 1992. Since then general coordination has taken place through EM's Strategic Laboratory Council, a national laboratory team that keeps EM apprised of progress in environmental technologies. The program also periodically checks EM interest in the technology with recommendations for specific applications (e.g. the destruction of explosives in a waste stream at Pantex).

Mr. Myers. Are they (the Department's environmental cleanup technology development program) providing any funding support?

Mrs. Ervin. There has been no funding support for solar detoxification from the Office of Environmental Management (EM) since the cooperative project at Livermore, California in 1992.

GEOTHERMAL ENERGY TECHNOLOGY

Mr. Myers. The Geothermal budget reflects a slight decrease from FY 1995 due to the completion of several technology development efforts related to drilling, power plant, and materials technologies. Your testimony indicates that there are significant system cost reductions in the near term due to these efforts. Please elaborate on the cost reduction achievements.

Mrs. Ervin. Since the late 1970s, the partnership between the Department and the Geothermal industry has yielded numerous technical advances that have served to reduce the cost of geothermal power to its present level of 5 to 10 cents per kilowatt-hour. All of the following advances currently are in commercial service, but the list is not complete: the Department's contribution to the development of the polycrystalline diamond compact drill bit, high temperature elastomers for drill bits and drill pipe protectors, rotating head seals for drilling, lost circulation control tools and materials, the crystallizer - clarifier technology for treating geothermal fluids, downhole instrumentation for high temperature environments, a downhole televiewer, greatly improved exploration and reservoir management technologies, and a computer code that enables geothermal plant designers to predict where and when scaling and corrosion will occur. The process is ongoing. Research now underway that will lower geothermal costs even further includes: polymer cement coatings that will make some geothermal plant components much cheaper, an acoustic signalling system that will cut drilling costs, a bioremediation technique that will greatly reduce the cost of handling certain geothermal solid wastes, a slim-hole drilling system that will halve the cost of wells for geothermal exploration and reservoir confirmation, advanced seismic measuring and analysis techniques that will improve management of production from geothermal reservoirs, advanced heat rejection systems that will improve geothermal plant efficiency. This work is being carried out in close cooperation with the geothermal industry, which shares the costs.

Mr. Myers. As noted, the FY 1996 budget is slightly down from FY 1995. This is interesting considering that last year the request for Geothermal represented one of the largest increases for the Energy Efficiency and Renewables program. Does this reflect a change in Department of Energy strategy for the Geothermal program?

Mrs. Ervin. There is no change in strategy. All of the new activities which began in FY 1995 continue into FY 1996. The minor difference in the FY 1996 request compared to FY 1995 is due to the completion of some projects, and a reduced need for capital equipment in FY 1996. Projects being completed include reservoir research at The Geysers in California and the Department's commitment to the innovative generation demonstration project.

Mr. Myers. The one area in Geothermal that did show an increase was an additional $7 million to conduct studies of the pressure decline problems at the Geysers geothermal energy pipeline project. What are the problems that are being studied and the potential implications for the Geothermal program?

Mrs. Ervin. In the FY 1996 budget request, $7 million is identified for Climate Change Action Plan activities. Of this, $2 million is intended for a 26-mile pipeline from Clear Lake, CA to The Geysers geothermal field. The pipeline will carry treated effluent from a sewage plant to be injected into the geothermal reservoir in order to sustain production of electric power and add an anticipated 50 to 100 MWe. The Department has provided $3.7 million to the project in prior fiscal years. The $40 million cost of the pipeline is being shared by the geothermal industry, the U.S. Bureau of Land Management, the Environmental Protection Agency and the California Energy Commission.

Mr. Myers. What is the status of the National Advanced Drilling and Excavation Technologies (NADET) program?

Mrs. Ervin. The National Research Council has published its final report on advanced drilling and excavation technologies, recommending a research agenda that will lead to substantial reductions in drilling and excavation costs. In the course of implementing the Council's recommendations, the Department has formed a research coordination group, composed of offices with a strong interest in NADET. These offices include: Efficiency and Renewables, Fossil Energy, Environmental Management, Radioactive Waste, and Energy Research. Other agencies, such as the National Science Foundation and the U.S. Bureau of Mines, as well as industrial organizations, have been invested to join. The first set of solicitations for proposals under NADET have been issued through the auspices of the Small Business Innovative Research (SBIR) Program. Regional workshops to incorporate the views of industrial stakeholders into NADET are planned for the spring.

Mr. Myers. One of the objectives of the NADET is to reduce drilling costs by at least 50 percent. When is that objective expected to be achieved?

Mrs. Ervin. Based on current NADET plans, the objective is targeted for achievement within eight years.

Mr. Myers. What is the status of finding an industrial partner for the Fenton Hill Hot Dry Rock demonstration project?

Mrs. Ervin. After confirming the existence of commercial interest, we have issued a competitive solicitation for substantial cost-sharing on a commercial hot dry project. The solicitation closes on April 28, 1995. If there are meritorious proposals that conform to the published requirements, the Department will select a winner and proceed to negotiate a contract for a project. If there are no such proposals, the Department will terminate operations at the Fenton Hill site.

Mr. Myers. What is the status of efforts to commercialize the geothermal heat pump?

Mrs. Ervin. The Geothermal Heat Pump Consortium was formed in November, 1994. Under the joint leadership of Edison Electric Institute and National Rural Electric Cooperative Association in cooperation with the Department and the Environmental Protection Agency, membership in the consortium totals over 100 organizations, more than 70 of which are utilities, including 7 of the nation's largest investor-owned utilities, rural electric cooperatives, heat pump manufacturers and others.

The Consortium is currently evaluating existing research and related programs to determine the most successful approaches to performance measurement, uniform standards, cost control, design, training, marketing, and financing. Also, the Department is conducting research to reduce the initial costs of geothermal heat pump systems.

SOLAR AND RENEWABLES

Mr. Myers. What is the status of the Geothermal Heat Pump program that is cost-shared with industry?

Mrs. Ervin. Annual dues from utility Consortium members now exceed $1.5 million. These dues plus DOE funds will be used to complete the evaluation effort, develop detailed plans for the national geothermal heat pump program, and provide management and technical assistance to the Consortium's utility members. The Consortium also will furnish matching funds for up to 1/3 the cost of 12 model geothermal heat pump programs to be conducted by member utilities. The utilities are motivated to provide the other two-thirds of the costs because these systems can substantially reduce both summer and winter demand peaks for electric power. In severe weather, such peaks cause brownouts when power demand exceeds generating capacity.

Mr. Myers. What level of funding are you recommending in the 1996 budget request.

Mrs. Ervin. Under the Climate Change Action Plan the Department has requested $7 million for geothermal program activities, of which $4.5 million is designated for geothermal heat pumps.

Mr. Myers. What is your commitment to the industrial participants?

Mrs. Ervin. The Department has committed $35 million of the total estimated program cost of $100 million, the balance of which will be paid by industry. The payments are to be spread over six years, and are contingent on the availability of appropriated funds. At the conclusion of this program, the industry is expected to be self-sustaining. It is clear to the Department that this investment will pay handsome dividends to the nation in the form of increased sales of geotheramal heat pumps and associated jobs, reduced energy consumption, lower energy costs and improved control on air pollution.

Mr. Myers. Why have you not requested the amount that would keep the program on-line with your commitment to the industries?

Mrs. Ervin. We have requested $4.5 million for Fiscal Year 1996. This was allocated after thorough consideration of the program's goals, its status, and budgetary constraints.

WIND ENERGY

Mr. Myers. Your testimony indicates that the price of wind energy is in the range of 5-6 cents which is comparable to the 3-5 cent average production cost of conventional electricity. If that is the case, is the wind energy industry increasing its share of the market? If not, why not?

Mrs. Ervin. The relatively low price of natural gas, its ready availability, the trend to power purchase contracts, and a more competitive electric marketplace are retarding the development of the wind market. The Department is working with key stakeholders to develop improved technology and to establish user confidence in wind as a generating resource. Wind can be competitive in some markets based on life-cycle costing in which fuel costs are expected to rise faster than inflation. The Wind Program projects that our activities will leverage 3000 MW of new capacity by the year 2000. The Department believes that wind can be cost competitive with other generation options on a life-cycle basis.

Mr. Myers. What progress has been made in the Turbine Development program?

Mrs. Ervin. The development of technologically advanced, higher efficiency wind turbines is one of the highest priorities of the U.S. wind industry, as well as the DOE Wind Program. A number of parallel activities are included in the program. For the 1995/1996 time frame, three near-term improved turbines have been developed and are being tested with a cost goal of 5 cent per kWh in moderate winds, and three additional value engineered turbines are under development and testing with the same cost goal. In addition, six innovative subsystems contracts have been initiated for components such as variable speed generators for incorporation in new industry turbines. The major effort is the next generation turbine development project targeted at a cost of energy of 4 cents per kWh or less in moderate winds. Seven conceptual design contracts are now under negotiation, and selection of 2 to 3 contractors for cost-shared full system development is planned for late in FY 1995. By the 1998 time period, the 4 cent per kWh target will open up much of the Great Plains to wind energy development, and provide major export opportunities as well.

Mr. Myers. As a part of the Climate Change Action Plan, an initiative to facilitate the deployment of wind energy in all regions of the country was the establishment of four highly leveraged 25 MW windfarm projects. What is the status of this initiative?

Mrs. Ervin. A solicitation for 25 MW or larger cost-shared wind projects has been issued by the National Renewable Energy Laboratory, with the Federal contribution limited to 20 percent or less. Eight proposals for domestic wind turbine installations totaling over 200 MW under the $8 million Wind Energy Deployment Project have been received. The objective of the project is to accelerate the deployment of state-of-the-art wind turbines to support the U.S. wind industry and the objectives of the Energy Policy Act of 1992. Once deployed a 25 MW wind plant could produce up to 70 million kilowatt hours of electricity; this in turn would displace production of about 38 million pounds of carbon dioxide each year from utility fossil plants (including coal, oil and gas).

Mr. Myers. At this point, is the U.S. competitive in the world markets for energy equipment?

Mrs. Ervin. The United States wind industry is competitive in world markets. We are beginning to see increased sales of U.S. machines as a result of technology developments jointly funded by industry and the federal government, industry's marketing efforts and the Department's support. Where United States industry loses a sales edge is in the many export support efforts offered by European and other countries active in the international arena. In order for the United States to compete in these markets in the long term, improved and more cost-effective wind turbines will be required.

Mr. Myers. Where does wind energy fit in the Department's strategy to increase the international market penetration for renewables technology?

Mrs. Ervin. While marketing subsidies by foreign competitor governments on behalf of their domestic firms create unlevel playing fields, the single strongest counterbalance, in our view, is better technology. This conviction is at the heart of our strategy for the wind program. The decision to pursue the Turbine Development Program, which is intended to combine numerous technical gains of the past several years into one or more advanced machines, was heavily influenced by the recognition that advanced technology was needed to compete successfully world-wide as well as to achieve greater penetration domestically. Historically, the US based wind industry has done poorly in global markets and, although several recent sales appear to begin a trend reversal, the program goal is to leapfrog world competition and promote a self-sustaining US wind industry. Additionally, near term world markets for wind are projected to be hundreds of thousands of megawatts, or hundreds of millions of dollars, and potential US economic benefits from market share increases are thus likely to be both large and near term.

BIOFUELS ENERGY

Mr. Myers. The Department is requesting a $20 million increase in this program for FY 1996. Describe the new initiatives that will be supported by this increase.

Mrs. Ervin. The increase in this program is for "Rural Energy and Agricultural Development Initiative" (READI) for Bioenergy. READI has been jointly formulated with the Department of Agriculture to enhance the ability of the initiative to revitalize rural America and potentially decrease the need for farm support programs. In response to the DOE/USDA "Biomass Power for Rural Development" solicitation that closes May 9, 1995 over 350 requests for the solicitation have been received to date.

The Department has been jointly developing with industry advanced gas turbine/steam turbine combined cycle systems and fuel cells. These developments enhance the utility of high-efficiency biomass gasification systems for the production of electric power. Biomass power as a baseload/intermediate option in the Midwest and the Eastern U.S. has the largest near term market potential of all the renewable technologies. The $20 million increase in funding is to form energy partnerships with industry for pioneer plants in selected niche markets, decrease the cost of feedstock production, and develop materials for turbines and hot-gas cleanup systems which can be operated with biomass gasses. Industries interested in this initiative include agriculture (i.e., alflafa, switchgrass and sugar cane), ethanol producers, pulp and paper manufacturers, and the chemical industry. It is expected that several gasification plants will be built and operated to demonstrate the technology within those market segments. Increased feedstock production will be demonstrated at regional centers in the Midwest, Northeast and the Southeast.

In addition, in our Industry Sector, landfills remain the single largest source of methane emissions nationwide, generating over one third of this potent greenhouse gas. Landfills emit methane for generations. Admittedly, there are over 120 sites where landfill gas is being utilized for its energy value. However, these sites capture only a small fraction of the total methane produced each year (12 percent). Working with the industry and the U.S. Environmental Protection Agency, the Department plans to test techniques to improve the overall production, capture and utilization of landfill gas. Many landfill operators have expressed their interest in working with us on these field tests. The combined actions of industry, EPA, and the Department should increase the number of landfill gas utilization sites to several hundred by the year 2000.

Anaerobic digestion of municipal solid waste (MSW) is still very much an emerging technology. It has yet-to-be accepted as a MSW management method. Projects worldwide are only in the demonstration phase. This is despite the potential of providing an environmentally friendly way for communities to generate fuel and dispose of their biodegradable wastes. The Department's pilot plant will test a technology innovation that should increase the productivity of anaerobic digestion of MSW several fold over existing methods. MSW combined with tuna sludge will be tested because the urgent need for this technology came from American Samoa. The main island has little space for landfilling and tuna sludge is dumped at sea. The technology should have also widespread applications to other industrial food processing wastes.

Mr. Myers. One of the stated objectives of the Biomass Power Initiative is to improve the socioeconomic condition of rural communities through the establishment of dedicated biomass feedstock supply infrastructures. At this time, have specific communities been chosen on these ventures?

Mrs. Ervin. Specific communities have not yet been chosen for these ventures. The collaborative DOE/USDA "Biomass Power for Rural Development" solicitation closes on May 9, 1995. After this date a Source Selection Committee will convene to review all proposals submitted in response to the solicitation, and to select the winning proposals. One of the key determining factors for project selection will be the evidence presented of the project's potential for rural development with preference to the development of distressed communities.

ELECTRIC ENERGY SYSTEMS

Mr. Myers. Provide the status of the Electric and Magnetic Field Effects (EMF) research program.

Ms. Ervin. This program consists of the coordinated and complementary research efforts of the Department's ongoing Electric and Magnetic Fields (EMF) Biological Mechanisms Research program and the EMF Research and Public Information Dissemination (RAPID) program, which was established by the Energy Policy Act of 1992. The coordinated planning of both programs is focused on providing research results that will enable the National Institute of Environmental Health Sciences to assess the risk of EMF exposures as one of the final activities of the five-year EMF Research and Public Information Dissemination program. With Congressional appropriations in fiscal years 1994 and 1995 for both programs, the Department of Energy and the National Institute of Environmental Health Sciences are proceeding ahead with the implementation of the planned research and communication activities. Major communication products include an EMF hotline to respond to public inquiries and the dissemination of over 25,000 copies of a comprehensive EMF information booklet. With the understanding that the new five-year RAPID program complements the Department's ongoing EMF Biological Mechanisms Research Program, utilities and manufacturers have been providing matching non-Federal contributions for the RAPID program. In fiscal year 1994, these companies provided voluntary contributions that matched the appropriation for the RAPID program. Matching contributions for the fiscal year 1995 RAPID program appropriation are currently on pace with the receipt of contributions for fiscal year 1994.

Mr. Myers. Describe the collaboration activities between DOE and the National Institute of Environmental health Sciences (NIEHS).

Ms. Ervin. There are a variety of activities that are utilized to coordinate the electric and magnetic fields (EMF) research and communication efforts of both agencies. Collaboration between the agencies includes input on the development of each others plans; the continual sharing of information on plans, progress on activities and results; co-sponsorship of research replication efforts; participation in on-site reviews of research sponsored by each others programs: and participation in each others peer review processes. To ensure collaboration at the Federal level, both agencies actively participate in both the EMF Interagency Committee and in the informal EMF Interagency Working Group. Collaboration on a national and international level is accomplished by both agencies participation in the steering committee for the EMF Annual Research Review, the International EMF Research Coordinators Group, and national and international topical research workshops. The communication effort is a combined collaborative effort that utilizes other Federal agencies where appropriate, such as the EMF hotline, which is managed by the Environmental Protection Agency.

Mr. Myers. How much funding is included for FY 1996 for the National EMF Research and Public Information Dissemination (RAPID) Program authorized under EPACT 1992?

Ms. Ervin. Consistent with the House and Senate Committee report language that accompanied our fiscal year 1994 appropriation, the RAPID program is an addition to the Department's ongoing Electric and Magnetic Fields (EMF) Biological Mechanisms Research program, for which the constant level of $6.0 million is requested. Therefore, $3.924 million is requested for the RAPID program.

Mr. Myers. How does this compare with FY 1995?

Ms. Ervin. The fiscal year 1995 line item appropriation for the electric and magnetic (EMF) research and communication activities was effectively reduced from $14.0 million to $13.462 million, when the general reduction was applied. The general reduction was applied to both the Department's ongoing EMF Biological Mechanisms Research program and the EMF Research and Public Information Dissemination (RAPID) program. The resultant appropriation for the RAPID program for fiscal year 1995 was $7.693 million. This compares with a request of $3.924 million for the RAPID program in fiscal year 1996.

Mr. Myers. What is DOE's funding commitment to this effort beyond FY 1996?

Ms. Ervin. The Department has had a long term commitment to supporting research that will provide needed information on the issue of whether exposure to power-frequency electric and magnetic fields (EMF) results in adverse human health effects. Currently, the coordinated plans of both the Department's EMF Biological Mechanisms Research program and the five-year EMF Research and Public Information Dissemination (RAPID) program would require funding through fiscal year 1998 to enable the National Institute of Environmental Health Sciences to assess the risk of EMF exposures as one of the final activities of the five-year program. Absent a major research breakthrough, the implementation of the plan for the EMF Biological Mechanisms Research program would require the continued level funding of $6.0 million in both fiscal year 1997 and 1998. Funding to fully implement the RAPID program would require an appropriation of approximately $17 million spread over fiscal years 1997 and 1998. Since the first year of appropriation for the RAPID program was fiscal year 1994, authorization for this program would need to be extended to fiscal year 1998 to meet the intent of it being a five-year program.

Mr. Myers. The FY 1996 budget for Electric Field Effects is a 30 percent reduction below the FY 1995 level. What reductions in work scope will occur?

Ms. Ervin. The Electric and Magnetic Field (EMF) activities are predominately health-effects related research. Therefore, the effect of the proposed reduction in the requested level of funding compared to the fiscal year 1995 appropriation would be that fewer research projects will be initiated in fiscal year 1996.

Mr. Myers. What is the status of the implementation of section 2117 of the Energy Policy Act requiring a 5-year program on high temperature superconducting electric power equipment technologies?

Ms. Ervin. The Department has implemented a five year program which consists of R&D activities directed to high temperature superconducting electric power equipment technologies. The research efforts are directed toward development of improved practical processes for manufacturing high temperature superconducting wires. In parallel, support is being provided for superconducting partnerships composed of four vertically integrated company teams committed to prototype development for eventual product commercialization. The potential products considered are power cables, electric motors and generators, and fault-current limiters.

Mr. Myers. The Superconductivity Partnership Initiative is designed to target specific products for commercialization through the development of prototypes of major elements of an electric power system. what is the status of this initiative?

Ms. Ervin. A competitive competition in FY 1993 resulted in FY 1994 awards to four industrial consortia. Each is committed to eventual commercialization of a ground-breaking superconducting energy system. Reliance Electric (Cleveland, OH) leads a motor development team, General Electric (Schenectady, NY) leads a generator team, Martin Marietta (San Diego, CA) leads a current limiter team and the Electric Power Research Institute (Palo Alto, CA) leads a transmission cable team. These consortia represent a new approach for U.S. private sector R&D in that each team contains three industry sectors - equipment users (electric utilities), manufacturers (a large business), and superconducting component supplier (a small, high-tech business). The interaction of these non-competing companies has been very productive and each is on, or ahead of, their FY 1995 goals. These goals are to build and test a 125 horsepower superconductive motor by the team lead by Reliance Electric (Cleveland), a 100 megawatt electric generator superconductive rotor by the team led by General Electric (Schenectady, NY), a 2.4 kilovolt electric utility current limiter by the team led by Martin Marietta (San Diego), and a 4000 ampere, 1-meter power cable by the team led by the Electric Power Research Institute.

A solicitation for Phase 2 proposals will soon be issued. Phase 2 will verify the designs developed in Phase 1 by testing systems under electric utility conditions. These systems will be a considerable advancement over the Phase 1 hardware, both because improved wire will be used as well as because the systems will be scaled up based on the earlier experience gained. Nevertheless, Phase 2 remains a high-risk venture because the superconducting wire will not completely satisfy cost and performance requirements until 1998. This calculated risk of expecting wire technology to be ready when commercialization steps begin will enable U.S. companies to capture this new market years ahead of the competition.

Mr. Myers. How much of the total budget for Electric Energy Systems is targeted for CRADA's?

Ms. Ervin. The Department's Electric Energy Systems program element consists of: Electric Field Effects Research, Reliability Research (R&D on advanced Transmission and Distribution technologies), Systems and Materials Research (R&D on high temperature superconductivity). The Department conducts the Electric Energy Systems program in collaboration with utilities, industry, universities, state energy agencies, and other federal entities. Due to the diverse nature of the program, these collaborative activities take many forms, including CRADA's, cost-shared contracts, cooperative agreements, partnerships, and consortia. On a case by case basis, the EES program and a potential collaborator select the most appropriate collaborative arrangement tailored to the parties' needs. The Department has found that within the EES program element the Superconductivity program is especially well served by employing CRADA's, and almost all of the EES CRADA's are in that program. In fact, in FY1995, the superconductivity program has thirty-five active CRADA's, involving approximately twelve million dollars in Federal funds. The Department anticipates that this level of CRADA activities will continue in FY1996 and has targeted approximately $12.5 million (30%) of the EES budget request for CRADA's.

Mr. Myers. An increase of $6 million is proposed to accelerate the development of high field, high temperature superconducting magnets. What market application is envisioned for this technology?

Ms. Ervin. High field, high temperature superconducting magnets are being designed separately in two of the Superconductivity Partnership Initiative projects - the Reliance Electric motor project and the General Electric generator project. Both would benefit from the proposed, generic, magnet technology effort. Conventional motors and generators are limited to magnetic fields of 2 Tesla. The proposed magnet technology effort would develop 5 Tesla magnets which would accelerate meeting the targeted Superconductivity Partnership Initiative goals of more powerful and compact motors and generators. Other potential markets are magnetic energy storage systems for utility applications and magnetic separation systems for materials processing.

Mr. Myers. What is the time frame for this development activity?

Ms. Ervin. The proposed activity is for 3 years, and will end in FY 1997.

Mr. Myers. How much is included in the DOE budget to support the National Electric and Magnetic Fields Advisory Committee?

Ms. Ervin. Our estimate of the funding required to enable the National Electric and Magnetic Fields (EMF) Advisory Committee to fulfill their statutory functions is $150,000 for fiscal year 1996. This committee provides advice on the design and implementation of the program, including the preparation of solicitations for proposals to conduct research under the program. With their representational viewpoints, they provide valued input on the responsiveness of communication products developed by the program. This Advisory Committee also maintains an active coordination role with the EMF Interagency Committee in order to make recommendations to the Interagency Committee on their duties. The Advisory Committee receives reports from the performers of activities under the program when those activities are completed and periodic reports from the National Academy of Sciences on their review of these completed activities. The EMF Interagency Committee also consults with the Advisory Committee on the interim and final reports to the Congress for the program.

HYDROGEN RESEARCH AND DEVELOPMENT

Mr. Myers. Why should hydrogen be included in the energy research and development portfolio?

Ms. Ervin. Hydrogen is included in the energy research and development portfolio because of its potential as a non-polluting, efficient and cost-effective fuel, versatile energy storage medium and complementary energy carrier that can be derived entirely from domestic resources. The Department is developing the critical technologies linking hydrogen production, transport, and storage to meet a broad range of end-use sector applications.

Mr. Myers. What will be the focus of this program in FY1996?

Ms. Ervin. In FY1996, we will continue to focus on the core program for advanced technologies: (1) processes that make use of renewable sources for hydrogen production such as photoconversion (including photobiological, photochemical, and photoelectrochemical processes), gasification and pyrolysis; (2) advanced storage materials for mobile and stationary applications; and (3) analytical studies to define the demonstration program.

Mr. Myers. FY1996 represents a decrease from FY1995. What is the change in program scope?

Ms. Ervin. The program will continue the core R&D activities to develop critical long-term technologies, while the near-term, industry-led hydrogen production R&D will be stretched out at the currently requested FY1996 funding level of approximately $7.5 million compared to the appropriation of $10 million in FY1995.

Mr. Myers. How much funding throughout the Department is spent on hydrogen research?

Ms. Ervin. The Department has requested $15.6 million for direct hydrogen production, storage, transportation and utilization research programs in FY1996. The RD&D programs described in the attached table represent all direct hydrogen and hydrogen-related funding within the Department. These efforts are carried out within the Offices of Energy Efficiency and Renewable Energy (EE), Fossil Energy (FE), and Energy Research (ER).

IN-HOUSE ENERGY MANAGEMENT

Mr. Myers. Since the inception of the In-House Energy Management program, what accomplishments in terms of cost savings and energy efficiencies have been achieved?

Mrs. Ervin. The In-House Energy Management program has been in existence since fiscal year 1977, and the Department has reduced its energy consumption per square foot in buildings by 44 percent between fiscal years 1975 and 1993. Since fiscal year 1985, the Department has reduced its energy consumption per square foot in buildings by over 20 percent, already achieving the fiscal year 2000 requirement of the Energy Policy Act of 1992. In process energy consumption, the Department has reduced its energy consumption per square foot by over 40 percent since FY 1985. Despite these achievements, there are still substantial energy savings opportunities in the Departmental facilities.

Mr. Myers. What is the objective of the experimental 2-year chiller replacement program? What is the projected cost?

Mrs. Ervin. The Department's In-House Energy Management Program has initiated a two-year program to provide joint funding with other DOE organizations for integrated chiller replacement projects that include cooling-load reduction measures. This will improve energy conservation, allow chillers to be down-sized to operate more efficiently while reducing investment cost, and support the regulatory phase out of chlorofluorocarbons. It is anticipated that the Department will spend approximately $200 million in chiller replacements at its sites over the next 10 years. This pilot program will accomplish only a small portion of the chiller replacements within the Department (approximately $10 million), and is intended to encourage and demonstrate the benefits of an integrated energy conservation approach. By reducing consumption, chiller size can be reduced, saving substantial capital investment and operating costs.

BIOFUELS TRANSPORTATION SECTOR

Mr. Fazio. As you know, the funds to support the Gridley project have come from the Biofuels Energy Systems budget, in particular the Transportation Sector - Biomass Fuels, Biochemical Conversion line item. Last year, the budget included $23,044,000 for this particular account. For Fiscal Year 1996, you have requested $23,878,000, an increase of $834,000.

This is in stark contrast to the $31.2 million requested by the Department for Systems Development under the Utility Sector - Biomass Systems account, which reflects an increase of $15.1 million over Fiscal Year 1995 and a $20 million investment in commercialization of biomass plants that will generate electricity.

I appreciate the Department's support for the Biochemical Conversion budget, which includes funding for the NREL pilot plant that the Gridley project is depending upon to test the rice straw feedstock. But your budget submission seems to contain no funding for further commercialization work on technologies like those being developed through the Gridley project.

My question is does the budget submission sufficiently support the biomass ethanol budget and what resources are available in the budget to support the continued development of technologies like those being developed in the Gridley project?

Mrs. Ervin. The FY 1996 Biofuels Energy Systems budget request includes a $20 million increase to support the Rural Energy and Agricultural Initiative (READI). This initiative will consider projects that co-produce electricity and ethanol. It is my understanding that the Gridley project will likely co-produce electricity from the lignin and ethanol from the cellulose and hemicellulose. Therefore, the Gridley project and other commercialization projects like it should be eligible to compete for funds under READI.

Mr. Fazio. Funds invested in the commercialization of these technologies are matched by the private sector, are they not? (The National Energy Policy Act of 1992 requires 50 percent non-Federal cost sharing on all commercialization projects.)

Mrs. Ervin. Yes, this requirement is included under Title XXX, Section 3002 (b) and (c) of the National Energy Policy Act of 1992, which requires that at least 50 percent of the costs directly and specifically related to a demonstration or commercial application project be provided from non-Federal sources. However, the Secretary may reduce the non-Federal requirement under this Section if she determines that the reduction is necessary and appropriate in considering the technological risk involved in the project and is necessary to meet the objectives of this Act.

Mr. Fazio. It is my understanding that the biomass ethanol technologies that are supported by the Department--for rice straw for example--have wide applications for the timber industry as well as the growers of other agricultural commodities, such as corn, and tree and vine crops, even the wine grape growing industry Mr. Riggs will be interested to know. Is this correct and would you explain a little about the diversity of feedstocks that are available?

Mrs. Ervin. The biochemical and thermochemical conversion technologies being supported by the Department should be suitable for a wide range of feedstocks, including grasses (e.g., rice straw), vine crops, trees, and various agricultural wastes and residues. Some of these feedstocks may be more suitable than others because of cost factors, quantity of available material, or ease of conversion. If the feedstock is grown as a crop, certainly the farmer or tree grower will need to have a fair return on his investment. His determination on whether or not to grow energy crops will depend on a reliable market, as well as where he lives and what the competing uses are for his land. Waste feedstocks that are already collected, or easy to collect, such as corn fiber, rice straw, or sawdust have a distinct advantage. If vine crop wastes are already collected, they would fit into this category. In any case, each situation needs to be evaluated on its own merits with an appropriate business plan developed, and the material tested in the laboratory at the bench scale and in a process development unit, before a determination can be made about its potential.

Mr. Fazio. I think you would agree there are enormous export opportunities for the biomass fuel technologies being developed by the Department--for both those that produce ethanol and those that generate electricity.

What can you tell us about the size of the export market for these technologies, the potential share of that market that could be dominated by U.S. technologies, and the benefits that will accrue to the domestic economy if the Department is successful in helping the private sector to develop the commercial technologies to meet this export demand?

Mrs. Ervin. Through DOE's strategic planning process, industrial competitiveness was identified as a critical element in fostering the Department's outlook for the future. With the assistance of DOE laboratories and facilities, and in concert with the Commerce Department, the Department of Energy encourages the active participation of industry in the export of alcohol fuel and electricity technologies abroad where the market potential is quite large. Because the fuel and electricity pricing structure is much lower in the United States compared to that of other countries, I agree that there are enormous export opportunities for the biomass fuel technologies being developed by the Department.

DOE'S BASIC MISSION

Mr. Fazio. As you may know, this Subcommittee started its hearing this year by listening to representatives of various "think tanks" extol the virtues of private, market-based research and development. Why can't research and development simply be carried out by the private sector? What do you see as the proper role for the federal government in developing these technologies? Some critics are advocating creating a better investment climate by providing R&D tax credits and reducing the capital gains tax. Why do we need government involvement in energy efficiency and renewable energy technologies?

Ms. Ervin. In general, the private sector can be relied upon to fund the R&D that society needs or prefers. It is well-equipped and rewarded for investing in market-based research into commercial products. Certain companies, for example, are well motivated to fund R&D into understanding the fundamental absorption differences of diapers between, say, "Pampers" and "Huggies." However, in certain areas important to our Nation's national security, environmental quality and the scientific and technical underpinnings of our Nation's energy and economic future, the market has good reasons to invest less in R&D in these areas then society or good public policy would prefer. These reasons are:

- The prices of such public benefits are not fully reflected in markets, nor in most profit-oriented corporate investment objectives.

- The nature of the R&D is aimed at producing a "public good," where an individual firm cannot recover its research costs by appropriating to itself the benefits of the knowledge (i.e., public good) it creates.

- The level of technical difficulty of the task (i.e., costs, time) and the overall riskiness of the R&D, where the successful payoff of R&D is not assured in advance, are too high, and cause individual risk-adverse firms to do less than a diversified society as a whole would prefer.

- The structure of certain industries is fragmented and works against sufficient levels of R&D spending because firms in these industries are too small to undertake certain kinds of R&D projects.

Within this context, the proper role for the Federal Government in supporting the development of energy technologies is not to subsidize or displace private sector responsibilities for R&D, but to complement them selectively in ways that are both: (1) important to the achievement of broad public goals; and (2) justified by one or more of the above-mentioned imperfections in the marketplace.

The Federal Government also plays an important role in creating a supportive economic and regulatory environment that stimulates private sector investment in R&D. Tax policy, including the prevailing "research and experimentation" tax credits already available to industry, is part of this environment. Tax credits, however, are notoriously expensive means for stimulating incremental investment. Although popular among potential recipients, they have low leverage. Definitional problems concerning qualifying expenditures often result in allowing tax credits, not just for the incremental investment, but for the entire investment, including the base amounts which would have occurred anyway. Similarly, it is not clear how general reductions in capital gains taxes can correct specific market imperfections. Without correct pricing of societal benefits, market-oriented solutions would seem to be fundamentally limited in redressing such concerns.

Finally, the case for Federal support of R&D for energy efficiency and renewable energy technologies is rooted in an understanding of: (1) the importance of these technologies to our Nation's long-term national security, energy, economic and environmental policy goals; and (2) the specific nature of the R&D (high-risk, pre competitive) and the related imperfections found in each market area. In general, these R&D programs are high-risk ventures, providing bold leadership where none would otherwise exist, requiring sustained investment over many years, and where the benefits to society are potentially large. Already, the Department has produced many R&D successes in these areas with significant public and economic benefits accruing to U.S. society. Moreover, these R&D programs are not just good public policy, many have already added revenues from associated taxes on sales, profits, and incomes flowing back to the U.S. Treasury in amounts that far exceed the cost of the original R&D investments.

Mr. Fazio: Why do we need government involvement in energy efficiency and renewable energy technologies?

Ms. Ervin: Installation of energy efficiency technologies today can cut annual energy costs in businesses and homes dramatically - often with paybacks of 3 years or less. Yet many of these businesses and homes have not installed this equipment or realized these savings. Many renewable energy technologies are cost-competitive or nearly competitive in a variety of situations today. Yet while renewable energy use is on the rise in the utility industry and in end use applications, its use is not expanding nearly as quickly as its potential. In each case, barriers to the rapid deployment of these technologies - technologies that save money today - prevent markets from responding efficiently. The Federal government has a critically important role in reducing the market barriers to the development and commercialization of these technologies.

The Federal government plays an essential role in supporting energy efficiency and renewable energy R&D and deployment. Because of a variety of market barriers, the private sector underinvests in technology development. These barriers include:

- competitive pressures to cut costs and increase near-term profits;
- high up-front costs of R&D, long lead times and risk of failure;
- difficulty in obtaining a competitive advantage from R&D investments when they can be quickly copied by competitors; and
- key industries, such as buildings, are extremely fragmented and lack the technical and financial resources to undertake substantial R&D on their own.

Working with the private sector, DOE has demonstrated that it can help to overcome these barriers, help to develop and commercialize advanced technologies and help ensure U.S. leadership in energy efficiency and renewable energy technology. Examples of successes abound. For example, a $3 million DOE investment in electronic ballasts for fluorescent lighting has resulted in sales of over $200 million per year and over $700 million in cumulative energy bill savings for U.S. consumers.

In addition to co-funding R&D, the Department works with State and local governments and the private sector to reduce the many market barriers that inhibit businesses and households from taking full advantage of the many economic opportunities in energy efficiency and renewable energy. These barriers include:

- lack of credible information on cost and performance of technologies;
- lack of access to up-front capital to make efficiency investments in households;
- in some cases, such as apartment buildings and rental properties, the owner has no incentive to make efficiency improvements because energy costs are passed through to others;
- perceived newness of renewable energy technologies to a conservative electric utility industry;
- lack of familiarity with efficiency and renewable technologies by the financial community; and
- energy prices that do not reflect the full social and environmental costs associated

with the use of that energy.

The Federal government has a unique role to play in overcoming these barriers through mechanisms such as information programs, technology transfer activities, demonstrations, leadership through Federal facilities and supporting state, local and utility company efforts to promote these technologies. Quite simply, without the efforts of the DOE Office of Energy Efficiency and Renewable Energy, many of the huge economic benefits resulting from energy efficiency and renewable energy technology development, commercialization and use either would not occur at all or would be delayed for many years.

A NATIONAL PROGRAM

Mr. Fazio. Assistant Secretary Ervin, there is a tendency by some in Congress to see solar as simply a regional issue.They see the solar and renewable energy program as on the fringe. disconnected from basic energy issues. They think of solar as a California only program, or a Florida only program.

Having had many representatives of the industry come to me to speak about these programs, I know there are larger, less regional, more national impacts of your programs. For example, companies that manufacture wind turbines aren't necessarily located in States where the turbines operate. Photovoltaic producers don't necessarily have to be in states where large scale plants operate.

Please discuss the regional impacts of solar and other renewable energy sources.

Mrs. Ervin. Renewable resources are spread throughout the nation. Every region has 2 or 3 resources that can make substantial energy contributions to regional energy needs. While it is obvious that many parts of the South and West experience strong year round solar insolation, portions of New England have also been shown to have significant solar potential. Wind is commonly assumed to be strong in mountain passes of the East and West and in coastal areas, but not so apparent are the great plains which offer enormous, largely untapped wind resources. Geothermal and biomass are similarly dispersed. In addition to regional use of regional resources, recent legislative changes related to electricity generation and distribution sugggest that national use of regional resources is likely. For example, increased transmission line access prompted by the Energy Policy Act of 1992 offers the prospect of wheeling of renewable based electricity from areas of high renewable resources to high demand centers.

EXPORT POTENTIAL

Mr. Fazio. I understand that the most dramatic need for new energy generation in the Twenty- First Century will take place in developing countries. The technologies you promote have tremendous export potential. First, can you give us a few examples where you have been successful in creating technologies that have been incorporated into products for export?

Mrs. Ervin. The Department of Energy (DOE) has worked with partners in industry on a number of efforts which have led to the improvement of U.S. technology which, in turn, has enabled U.S. industry to capture a greater share of international markets. For example, the U.S. solar photovoltaic (PV) industry currently exports approximately 70% of the products it produces, which translates to approximately a 40% share of the international PV market. One of the DOE PV programs which has led to the improvement of this technology is the PV Manufacturing Technology program (PV MaT). This government-industry partnership has resulted in significant module refinements and improvements in module manufacturing technology. Similarly, in the area of wind, the National Renewable Energy Laboratory under DOE-industry partnerships such as the Turbine Development and Value-Engineered Turbine programs have aided in the development of commercial products. Examples of this include FloWind's AWT-28, Zond Systems' Z-40 and the Atlantic Orient 15/50. To date, these and other U.S. firms have completed sales agreements worth $700 million. This includes $340 million in agreements signed during Secretary O'Leary's recent mission to China. In geothermal the partnership between DOE and the U.S. geothermal industry has yielded many technical advances that have reduced the cost of geothermal power to its current level of 5 to 10 cents per kilowatt hour which makes it directly competitive with conventional fossil energy systems. This in turn has directly contributed to the ability of the U.S. geothermal industry to capture approximately $2 billion in international sales. Among the geothermal technology advances fostered by DOE have been the polycrystalline diamond compact drill bit, rotating head seals for drilling, lost circulation control tools and materials, a crystallizer-clarifier technology for treating geothermal fluids, downhole instrumentation for high temperature environments, a downhole televiewer, much improved exploration and reservoir management techniques, and a computer code that enables geothermal plant designers to predict when scaling and corrosion will occur.

Mr. Fazio. Why are renewables well suited to export?

Mrs. Ervin. In many countries, particularly developing countries, there is a need to provide power to rural populations which currently don't have access to electricity. Further, those countries often find it economically infeasible to develop new conventional power generation facilities and electric grid extension programs to supply power to meet relatively small power requirements in rural areas. However, renewable energy systems such as solar photovoltaic, and wind, biomass, and small hydro can easily be sized to meet small rural power loads. Further, in recent years, in large measure because of technology development partnerships between the Department of Energy and the private sector, the cost of U.S. renewable energy technologies has decreased quite significantly, making renewable energy systems less costly than competing conventional power generation alternatives. In addition, many countries are incorporating larger renewable energy systems into their generation mix in order to reduce dependence on expensive imported petroleum, as well as to address environmental concerns associated with power generation by large plants fueled by petroleum and other fossil fuels. In this context U.S. firms which export geothermal and large scale wind technologies are finding increasing demand for their products and services. As a result, in developing countries where the highest rates of energy growth will take place, demand for renewable energy technologies is expected to rise significantly. Of an expected investment of over $900 billion for new generation capacity in the period from 1990 to 2010, as much as $100-$150 billion could be in the form of renewable energy systems.

Mr. Fazio. Where are the most immediate export markets and what technologies are suited for those markets?

Mrs. Ervin. The most immediate markets are in countries with high growth rates for electricity. In some cases these countries are looking for power generation alternatives to petroleum-fueled electricity generation systems, and/or power generation systems to meet electricity needs in rural areas. In both cases renewable energy technologies can help. In Latin America and the Caribbean (LAC), immediate markets for U.S. renewable energy technologies are Brazil, Chile, Argentina, Mexico, and the Central American nations. The technologies suited for these LAC country markets are solar photovoltaics, wind, geothermal, biomass and small hydro. In Asia, immediate markets exist in India, China, Indonesia, and Pakistan. Technologies in demand in these markets are solar photovoltaics, wind, geothermal, and small hydro. In Africa, country markets exist in South Africa, Botswana, and Lesotho. Here the principal technologies are solar photovoltaics, and wind. In Eastern Europe and the Former Soviet Union, there are immediate markets in the Russian Federation, and Ukraine. The principal technology is wind.

Mr. Fazio. Where does the greatest long-term potential for export lie?

Mrs. Ervin. The greatest potential will be in countries with rapid electricity growth, and relatively high rates of economic development. In Latin America and the Caribbean, countries that fall into this category are Brazil, Chile, Argentina, and Mexico. In Asia, the countries of India, China, Indonesia are in this category. In Africa, South Africa and its smaller neighbors such as Botswana, Zimbabwe, Lesotho, and Namibia represent good long term potential. In Eastern Europe and the Former Soviet Union, the Russian Federation, Ukraine, Poland, and possibly the Czech Republic represent good long-term markets. The technologies that should do well in these markets are the same as in the immediate market case, with the exception of Asia where demand for biomass technologies is expected to increase, and in Eastern Europe and the Former Soviet Union where in addition to wind, there should be increasing market opportunities for solar photovoltaic and biomass.

Mr. Fazio. What is it going to take to capture those markets?

Mrs. Ervin. Close DOE interaction with the U.S. renewable energy industry and its member firms which are in the field working hard to capture a larger share of foreign markets indicates that a number of things must be done. Market preparation, in the form of the identification and resolution of market barriers is very important. Additionally, the development of adequate infrastructures to facilitate business contacts, the development of financing mechanisms and procedures, project pre-feasibility studies, and the nurturing of specific replicable projects to fruition, are also important. The close interaction that DOE has with industry is in large part a product of the work of the Committee on Renewable Energy Commerce and Trade (CORECT). CORECT is an interagency working group administered by DOE whose mission is to coordinate Federal aid to produce the most effective support for industry its international marketing efforts. Among the efforts undertaken by CORECT are the following. Under market preparation, potential customers need to become more familiar with how U.S. renewable energy technologies can address their power needs. CORECT and the Americas'21st Century which implements CORECT export strategy in Latin America and the Caribbean is working with industry to increase awareness of the capability of U.S. technologies. In Brazil and in Chile, for example, it is sponsoring work with national, provincial, and regional organizations to demonstrate for customers in the public and private sectors how U.S. renewable energy technologies can provide power for a range of applications. These include solar photovoltaic and wind systems to provide power for home lighting, rural health clinics, small commercial enterprises, and water pumping for irrigation and livestock. In the development of financing mechanisms CORECT has supported the development of FINESSE (Financing Energy Services for Small-Scale Energy Users), a program developed to encourage the bundling of relatively small renewable energy loans into larger loan packages by the World Bank. This led to the formation of the Asia Alternative Energy Unit at the Bank which in turn led to the approval in 1994 of a $450 million renewable energy loan for India. Similar loan packages for other Asian countries are now being developed. With its partners in the U.S. renewable energy industry, DOE is also working with regional development banks and commercial lending institutions to insure that project financing is available to support renewable energy exports to all country markets of interest to U.S. industry.

Mr. Fazio. How does the Department of Energy's involvement in developing countries' energy markets help the U.S. renewable energy industries?

Ms. Ervin. Our activities relating to developing countries involve collection of information on energy needs, energy demand growth rates, availability of resources, characteristics of energy markets, identification of opportunities and contacts, and similar data gathering and dissemination efforts. Some of this activity is conducted under the purview of the Committee on Renewable Energy Commerce and Trade and some results from information collection efforts in individual technology programs. In addition, International travel by DOE principals, such as Secretary O'Leary's visits to India and China and my own to South America and Russia, can help to open markets. For US renewable energy industries, international markets can be a major source of economic life blood, providing cash flow during technology maturing and domestic market penetration stages. This is particularly true where technologies are cost competitive in marginally electrified or non-electrified areas of the world before they are competitive in the fully electrified markets of developed nations. The Department's role in helping US firms identify and take advantage of these opportunities is popular with industry and we have been encouraged to retain these efforts as part of our overall program.

Mr. Fazio. How does the U.S. renewable energy industry measure up to its foreign competition?

Mrs. Ervin. The U.S. renewable energy industry compares quite favorably across the full spectrum of technologies and in many cases is superior to technology available from foreign competition. Still, in spite of this technological competence, U.S. firms often find themselves at a disadvantage in foreign markets because of the significantly greater export assistance provided to foreign firms by their governments.

Mr. Fazio. What does the Department have to do to help level the playing field for our industries in the global marketplace?

Ms. Ervin. The Department is an active, effective member of the interagency Trade Promotion Coordinating Committee. In question #85, the key activities necessary to ensure that the U.S. has access to foreign market were outlined. The Department is active in all of these areas:

Competitive Export Financing -- The Department will continue to play a leadership role to mobilize the financial community in support of U.S. firms bidding on major energy and environmental projects abroad. Financing conferences and workshops have been sponsored in key markets bringing project developers, decisionmakers, U.S. suppliers and financiers together to discuss financing issues, including risk factors such as the legal and regulatory framework that underpins these projects.

Strong Advocacy -- The Department has substantially increased its advocacy for U.S. energy and environmental technologies and the companies that bring these technologies to the commercial market. The number of technical seminars sponsored in foreign countries to encourage the use of U.S. technologies has increased by 20 over the past two years. In a major show of support for U.S. exports, the Secretary of Energy has led Presidential Missions to India, Pakistan and China.

Laws and Regulations that Support Increased Competitiveness -- As part of the Department's restructuring efforts, DOE has begun an effort to consider the impact of laws and regulations on the competitiveness of U.S. firms. For example, the Department if currently engaged in a rulemaking to implement section 2306 of the Energy Policy Act, which sets limits on participation by companies in the Department's R&D programs. The Department has also taken a leadership role in the interagency effort to develop policies for China that balance U.S. strategic interests while allowing for export success in that market. We are committed to increasing the priority placed on competitiveness in developing policies and regulations affecting U.S. energy firms.

Vigorous Enforcement of International Trade Obligations and Continuous Pursuit of Negotiations to Open Markets and Remove Barriers to U.S. Exports -- The Department provides extensive technical expertise to the United States Trade Representative for trade negotiations. This is a little recognized, but extremely important contribution of the Department of Energy to removal of artificial trade barriers overseas that will lead to increased exports. The Department was active engaged in the negotiations associated with the U.S./Canadian and the North American Free Trade Agreement, and the Uruguay Round negotiations, as well as various other bilateral and multilateral negotiations. A Technical understanding of various traded technologies is key to effectively negotiating removal of trade barriers.

Continuing Commitment to the Science and Technology Base -- If the United States is to maintain technological competitiveness, it is essential that we continue to fund a strong program of basic research to provide new generation solutions to new generations of challenges.

RENEWABLE ENERGY PRODUCTIVE INCENTIVE

Mr. Fazio. As you know, the Renewable Energy Production Incentive, the so called "REPI" program, provides payments of 1.5 cents per kilowatt hour to utilities for electric output from solar, wind, geothermal, and biomass conversion facilities. This incentive is rougly comparable to the tax credits available to more traditional energy resources.

The Department has requested just $3 million in its budget to implement the (REPI) authorized in the National Energy Policy Act. What is the basis for the request of $3 million for FY96?

Mrs. Ervin. The payments cited are potentially available to State and municipally owned and cooperatively owned utilities, not all utilities. Our estimates for payment requirements for the program are $3 million in fiscal year 1995 and $10 million in fiscal year 1996. Congress appropriated $10 million for fiscal year 1995 and we thus expect to have a $7 million surplus. Assuming these unused funds are carried over to fiscal year 1996, the $3 million request for new funds plus the $7 million carryover is expected to be sufficient for program needs.

Mr. Fazio. How much of the $3 million allocated to REPI in the budget request do you anticipate will go to make project payment in FY96?

Mrs. Ervin. Virtually all of it. Our estimates for annual operating costs to support the administrative needs of the program are between $0.1 and $0.2 million. We are trying to establish handling and oversight proceedures so that costs will be near zero, but until we have a year or two of program experience we cannot be certain of these costs.

Mr. Fazio. In general terms, what criteria will the department use to determine the eligibility of projects?

Mrs. Ervin. To the extent the language is specific, we are following the eligibility requirements established in the law. Where interpretation or clarification is necessary, we are interpreting broadly -- that is, we are tending to be inclusive rather than exclusive.

Mr. Fazio. DOE's "Budget Highlights" suggests that the REPI program "may be supplemented by FY 1995 carryover funding." (p. 58) How ill this carryover be used?

Mrs. Ervin. The carryover will be added to fiscal year 1996 appropriations and used for payments to utilities for qualifing energy production.

Mr. Fazio. What impacts are likely if no such carryover remains after Congress acts on the rescissions proposals?

Mrs. Ervin. If our projections for qualifying energy production are approximately correct, there will be a $5 million to $7 million shortfall in funds for payout. Depending on the mix of renewable technologies involved, this will result in some applicants receiving full payment and some receiving partial payment, or in some receiving partial payment and some receiving no payment.

Mr. Fazio: Solar and Renewable Energy Programs are slated for a $35 million rescission. What impact would the proposed rescission have on the overall solar and renewable enrgy program?

Ms. Ervin: A reduction of this magnitude will adversely impact the achievement of important benefits to the Nation including economic savings, environmental savings, energy savings, enhancing the export of U.S. produced renewable energy technologies, and jobs. Specifically, economic savings of more than $3 billion in annual fuel cost savings by the year 2000 (in 1992 dollars), and more than $8 billion by 2010 will be reduced. The Program will be unable to achieve 7.2 million metric tons of annual carbon equivalent emissions savings by the year 2000 and 30 million metric tons by 2010. Total primary energy savings of 0.6 quadrillion BTUs by the year 2000 and 1.1 quadrillion BTUs by 2010 will be impacted.

The Solar and Renewable Energy Programs are primarily composed of several relatively small-scale applied research activities which are integrated to achieve maximum results with minimum resources. A large portion of the Solar and Renewable Energy Program is conducted by small businesses, colleges and universities and other non-profit institutions and much of this work is still being placed in contracts. Rescinding 9 percent of the resources for this work will cause great hardship to these entities and may also require the termination of some activities currently under contract with attendant termination costs. Most importantly, however, the rescission will greatly slow the on-going momentum of the Solar and Renewable Energy Programs, will require the expenditure of significant staff resources to implement, and will preclude the achievement of important benefits to the Nation.

THE GEYSERS PIPELINE EFFLUENT PROJECT

Mr. Fazio. The Geysers Pipeline Effluent Project will increase power generation from The Geysers geothermal field, the largest such field in the world, by some 90 to 70 megawatts. At the same time help solve a very onerous wastewater disposal program that affects my district in Yolo County. I appreciate your past and present support for the project.

Thank you also for your continued support of The Geysers Effluent Project. I understand that there is $2 million in the budget request to continue this project. Is this figure correct?

Mrs Ervin. The Department is planning to allocate $2 million to The Geysers Effluent Project in FY 1996.

Mr. Fazio. Please provide for the record a brief update on the progress of this important project.

Mrs Ervin. In FY 1994, the Department worked with Lake County and other agencies to complete the environmental impact report covering the effluent pipeline for reservoir injection at The Geysers. The environmental impact report is now being reviewed by the Environmental Protection Agency. The Lake County Sanitation District estimates that pipeline construction will begin in June 1995, with the project becoming operational in the second half of 1996.

Mr. Fazio. Are sufficient funds available to keep this project on an optimum schedule for completion?

Mrs Ervin. The funding for The Geysers Effluent Project is from a wide variety of sources including county, state, federal, and private sources. The Department's contribution is a relatively small percentage. There is a question as to whether Lake County will have sufficient county funds to upgrade its wastewater treatment plant.

RENEWABLE ENERGY PRODUCTION INCENTIVE

Mr. Bunn. Secretary Ervin, last year this Subcommittee had a hand in appropriating $10 million for the Renewable Energy Production Incentive (REPI) program set up by the Energy Policy Act of 1992. My understanding is that regulations to implement the REPI program have yet to be completed and that FY95 funds were used for program administration only. Is that true?

Mrs. Ervin. None of the funds appropriated in fiscal year 1995 for the REPI program have been spent. The rulemaking to implement the program is in the final stages. All staff effort has been completed and the draft final rule is in the final approval step.

Mr. Bunn. How much does the Administration's Budget request assume for the REPI program in FY96?

Mrs. Ervin. The fiscal year 1996 request for REPI is $3 million.

Mr. Bunn. If appropriated, how much of this amount will go towards program administration and how much will be allocated for actual incentive payments?

Mrs. Ervin. Essentially all of the $3 million REPI request will be used for program payouts except for an estimated $0.1 to $0.2 million will be used for administrative support.

Mr. Bunn. Do you agree that the level of environmental benefit derived by a renewable project is an important criteria for its inclusion in the REPI program?

Mrs. Ervin. In our review of Congressional reports relating to the Energy Policy Act and the REPI program, and in discussions with committee staff, it is our understanding that REPI was established primarily as an assist for renewable technology commercialization. Consequently, transition from technology maturity to market acceptance has been the principal driver for DOE in establishing the program. Nevertheless, we readily acknowledge that environmental benefits from renewable energy adoption are an important consideration when making decisions about program details.

Mr. Bunn. It is my understanding that the draft REPI regulations issued last year did not give equal consideration for certain types of projects. For instance, landfill methane recovery projects constitute a technology that has not yet been fully commercialized but yields substantial environmental benefits over alternative generating resources.

What is your time line for completion of the REPI regulations and what will the time line be for their implementation?

Mrs. Ervin. We anticipate that publication of the REPI regulations in the Federal Register will occur in the next 2 to 3 weeks. The program will officially begin 30 days following publication.

Mr. Bevill: How big a role do collaborations with private industry play in your efforts?

Ms. Ervin: Collaborations with private industry play a significant role in our efforts. Within EE's FY 1996 Solar and Renewable Request of $458.5 million, approximately $225.2 million will be allocated to cost-sharing arrangements with industry.

Mr. Bevill: What percentage of your total budget is designated for cost-sharing arrangements with the private sector?

Ms. Ervin: The $225.2 million of DOE's funding represents 49 percent of the Solar and Renewable Request.

Mr. Bevill: Do you see this percentage increasing in coming years?

Ms. Ervin: Yes, we anticipate that this percentage will increase in the future because DOE strongly encourages industry cost-sharing arrangements.

Mr. Bevill. As you noted in your written statement, your 1996 budget request represents a 9 percent increase over your 1995 appropriation. Why ask for this increase now, especially when Secretary O'Leary has indicated that the DOE intends to cut billions from the department over the next five years.

Mrs. Ervin. The Department addressed needs and benefits in individual programs when formulating the fiscal year 1996 budget request and made conscious decisions regarding increases or decreases in each area. The renewable energy programs have been selected for increased investment despite the prospect of future reductions for the Department as a whole. This decision recognizes the substantial technical progress over the past decade, the potential for near term impact, the increasing opportunities for market penetration, the growth in cost sharing by industry, the increased global commerce in renewables, and the general contribution to national energy security and environmental quality that accompanies use of these technologies.

Mr. Bevill. The increase in your budget request for solar international activities would suggest a new or at least increased initiative in this area. What activities and international markets would be targeted by this funding?

Mrs. Ervin. These international initiatives are targeted to increase exports of renewable energy technologies worldwide through the cultivation of strategic markets, public/private partnerships and by increasing commercial financing resources for major foreign purchases of U.S. renewable energy products. By increasing renewable energy exports, these efforts create new U.S. jobs and make U.S. industries more competitive worldwide. These initiatives will be undertaken in Latin America and the Caribbean, Asia, Southern Africa, Eastern Europe and the New Independent States.

Statement of Christine A. Ervin
Assistant Secretary for
Energy Efficiency and Renewable Energy
Department of Energy
FY 1996 Appropriations Hearings
March 14, 1995

Mr. Chairman and members of the Committee, I am pleased to present to you the Administration's budget request of $423.4 million for Solar and Renewable Energy Programs in FY 1996. The request reflects the President's commitment to continue development of renewable energy technologies and to increase their use in our Nation's energy portfolio.

This budget request constitutes an increase of 9% from last year's appropriation and presents you with an opportunity to support a sound investment decision for our Nation's economy. With that support, these programs have and will continue to deliver substantial beneficial returns for today and tomorrow. In my remarks today, I would like to focus on three policy questions at the core of our budget request and then go on to review our FY 1996 request.

The first question is: Why are renewable energy technologies important to the country?

The second question is: Why is it necessary and prudent for the Federal government to play a role in developing and commercializing these technologies?

Finally, the third question is: What is the payoff? What measurable, tangible returns do we provide the taxpayers for investing a portion of their funds in our work?

Let me briefly address each of these questions. Renewable energy technologies are important because low-cost and reliable energy resources are critical to our Nation's economy, to our industrial competitiveness, and to the welfare of all Americans. Energy drives the engines of our economic well-being. The typical American family spends more on energy consumption than it does each year on medical care. By focusing on our vast domestic resources in renewable energy and our technological capabilities, renewable energy investments increase our national security and position us for a secure economic future.

Today, more than a third of the GNP is "energy related". Although the oil embargoes produced remarkable improvements in our energy intensity, units of energy per dollar of GNP, those improvements have nearly stopped in recent years. Today oil imports account for over 50% of oil consumed, and amount to the single largest factor in our National trade deficit--even though prices paid for energy have remained relatively stable or even declined in real terms since the oil embargoes. Over the course of a decade, the United States alone is expected to invest as much as $200 billion dollars in new electricity generating capacity, just to replace aging power plants and to keep pace with rising demand.

The World Bank estimates that between 1990 and 2000, 600,000 MW of new electric generating capacity will be installed worldwide. This represents a total expenditure of $1 trillion, roughly $100 billion each year. The United Nations estimates that more than 2 million villages worldwide are without electric power for their water supply, refrigeration, lighting and other basic needs.

The Shell International Petroleum Company recently issued energy development scenarios to the year 2020. In the sustainable growth scenario, emerging renewable technologies progress along their learning curve, first capturing niche markets and then gradually expanding, and may well become commercially competitive over the next decades. In this scenario, by 2020 renewables contribute 20% to commercial worldwide energy. The contribution is estimated to grow to 32% by 2040 as technologies mature and diffuse into the market place.

The Department of Energy's research and development portfolio includes a balanced range of technologies, many being developed in partnership with the private sector. Many energy analysts point out that all energy resources will be required in the coming century to fuel world development.

Because of improvements in the technologies under our programs, pollution-free renewable energy is fast becoming a reliable option for electricity generation throughout the country. The development of cost-effective, competitive renewable energy and energy management technologies, deriving their power from domestic resources and free of foreign supply risks and rapid price fluctuations offers a true win-win-win proposition for all Americans. Renewables and efficient energy technologies are good for our economy, good for National economic security, and good for the environment.

The second question you are likely to face is why it is necessary for the Federal government to play a role in developing and deploying renewable energy technologies. What does the Federal government do that the private sector cannot do for itself?

The Department of Energy supports world-class research through our National Laboratories, universities and private research institutions. This budget request ensures that this country's basic scientific and technological foundation for energy efficiency and renewable energy development remains the strongest in the world.

The movement of technologies into the marketplace, however, requires additional investment in applied research, development and deployment of products to facilitate rapid return of embedded investment costs. For this reason, the FY 1996 budget request is structured to support not just basic and applied research, but the full continuum of product development from the early stages to the point where industry and markets can take over. In fact, the fully integrated process of basic and applied research, coupled with technology application and deployment is designed to reflect the fact that much basic and applied research is expressly guided by lessons that can only be learned in the deployment context. Rather than a single pipeline from research to commercialization, our industry partners have impressed upon us that the process is more a series of overlapping, interactive processes and that our programs should not be narrowly focused on one stage of the continuum.

As I just mentioned, our programs are strongly shaped and guided by continuous and systematic efforts to listen to one of our key customer groups--U.S. industry, including small businesses. In the last year, and in many cases at the express urging of U.S. energy industries, we have supported the formation or continuation of industry consortia or coordinating councils in the areas of wind energy, photovoltaics, solar thermal energy, biomass power, geothermal energy, hydrogen, superconductivity, electromagnetic field research, and others. The budget request before you, with its emphasis on technology advancement and industry partnerships in deployment, is a direct result of their telling us that this is best way, and the only effective way, to ensure a return on U.S. technological and research investments.

The third question, then, is whether our budget request invests the right amount of funding in the right types of programs and are we going to get the highest possible rate of return on the taxpayer dollar?

We face real challenges in ensuring that our Nation maintains its competitive leadership and reliable, low cost energy supplies. Restructuring and the advent of competitive reform in the electric utility industry have led to additional decreases in the previously modest research and development budgets in the utility industry. Just as industry researchers must fully justify their budgets to their chief executives and stockholders, we at the Department of Energy are obligated to Congress and the American people to ensure that investments in these programs are not just defensible but essential--not merely prudent but profitable.

The budget for these programs meets these high standards. It is balanced in scope and approach. It ensures that basic research continues in order to guarantee that the required technology base can lead to product improvements by industry. It also reflects the basic market reality that investments in research and development must be recovered--the sooner the better. Our programs are expected to result in the deployment of 20,000 MW of renewable energy generation by the turn of the century. That kind of success will mean long-term, highly-skilled jobs for thousands of Americans. In combination with our energy efficiency and energy management programs, our offices will deliver over $20 billion in energy savings for the Nation each year beginning just five years from now. That's $20 billion in added disposable income for our families, businesses and industries. With such technological capability as a foundation, the U.S. can remain an exporter of security--energy security--to the world.

Our renewable energy industries and corresponding federal programs are evolving into a major National success story. Renewable energy industries, in collaboration with our National Labs and Federal programs, are making substantial technology and process improvements. Prices for energy delivered by renewable energy technologies have dropped by orders of magnitude, from 90 cents per kwh to 20 cents in 1994, for photovoltaics; from 40 cents per kwh to 5-6 cents in 1994, for wind; from 9 cents per kwh to 5 cents for geothermal energy. This progress has been made through steady, modest increases in the Federal program budget over the last five years, with some leveling in that trend this year. It is important to emphasize this final point. The success in the renewable energy industries in recent years is directly related to rational multi-year programmatic focus designed to foster and accelerate the progression of technologies from the laboratory to the marketplace. Now, our renewable energy industries are poised to capture burgeoning domestic and international markets.

Let me now detail for you some of the highlights of our programs.

UTILITY TECHNOLOGIES

For utility-related renewable energy and energy efficiency programs, we are requesting $312.3 million in FY 1996 - $14.4 million over our request in FY 1995. By the year 2000, over 1 quad of renewable energy capacity will be installed, growing steadily to 4 quads by 2020. We also estimate that our utility technology programs will save the Nation more than $3 billion in annual fuel costs while simultaneously reducing environmental emissions by the equivalent of over 7 million metric tons per year. By 2020, these impacts will jump to $26 billion in annual savings and 75 million metric tons of carbon equivalent. Significant energy savings will result from these utility programs, amounting to 0.6 quad in 2000 (saving $4.1 billion) and reaching 3 quads by 2020 ($30.0 billion).

Program	FY 1995	FY 1996	Change
Photovoltaics	$87.5	$88.1	$0.6
Solar Thermal	$23.9	$26.1	$2.2
Wind	$47.1	$49.8	$2.7
Biomass	$18.3	$33.2	$15.1
Geothermal	$37.8	$37.5	-$0.3

Electric Energy Systems	$38.5	$41.6	$ 3.1
Energy Storage	$5.8	$6.0	$0.2

To achieve our goal to help America's electric power producers develop clean, renewable and more economical forms of energy, we focus on three principal missions: 1) To develop new technologies for electric power from renewable resources, including solar, wind, geothermal, and biomass energy; 2) to help the power industry address technical and institutional barriers that prevent energy efficiency and renewable energy systems from reaching full market potential; and 3) to work with the utility sector, regulators, and state governments to help them apply long-term planning that promotes consistent treatment of all resource options.

For utility-related programs, we focus our efforts on three broad areas, the first of which is Technology Advancement (see attachment) for which we are requesting $114.7 million in FY 1996 (+$3.9M). Here we carry out the critical R&D necessary to achieve technical viability and to approach cost-competitiveness with existing technologies. In our second area of focus -- Industry Partnerships in Deployment -- we are requesting $179.9 million to meet the growing energy and energy technology needs of our Nation. Our stakeholders have strongly stated that not only is technology deployment a critical element of commercialization but also that Federal partnership is a critical and necessary element of successful deployment, particularly for renewable technologies. To address these needs, we have adjusted our priorities, concentrating the bulk of the $13 million in new or increased investments to bridge the gap between proof-of-concept/early prototype development and actual marketplace acceptance and commercialization. The third element of our mission is Integration, in which we plan to invest a slightly decreased amount (-$1.7M) of $27.7 million in FY 1996. Though small when compared to the other two thrusts, these efforts provide us with the knowledge and tools needed to best direct our programs and achieve maximum impact with our technologies. Just as oil and gas companies need to locate new fields and determine the amount of resource available, we need to know the potential for renewable and efficiency technologies and how and where they may best be applied. Efforts in this area include resource assessment activities that provide essential data such as regional wind speeds and flow patterns, insolation intensities, and geothermal resources.

We also evaluate the potential for combining new renewable and/or efficiency technologies with conventional technologies already in use.

One example is our cooperative study with Northern States Power Company, slated for this year, to examine opportunities to enhance the value of wind energy systems by coupling them with energy storage systems, including batteries. Northern States Power is required (by state legislative mandate) to add more than 400 MW of wind capacity to their system by 2002.

Finally, and as required by EPACT, our Integration programs also include promoting the widespread adoption of integrated resource planning (or IRP) at the state level and encourage use of utility resource decision making processes and methods that improve energy and economic efficiency, ensure reliability of service, and promote competitiveness and innovation. While this program is not funded by this Subcommittee, it is an integral part of our coordinated programs.

PHOTOVOLTAICS

The FY 1996 request of $88.1 million keeps efforts at a steady pace, concentrating on utility applications analysis and deployment, improving manufacturing processes, and developing higher efficiency conversion materials. DOE's PV programs are on track for achieving the goal of having 1000 MW capacity of domestic (and 500 MW of foreign) grid connected systems in place by the year 2000. To help meet this goal, in FY 1996 we plan to start 10-15 grid-connected PV projects and partner with industry to start up two 10MW/year manufacturing plants (with commitments for additional follow-on capacity). Though DOE-funded PV projects typically require 50/50 cost share with industry, these dollars also generate an approximately five-fold increase in private investments in PV manufacturing plants and systems.

Specific key elements of the FY 1996 PV funding request include the Photovoltaics Manufacturing Technology (PVMaT) program and the complementary PV:BONUS (Building Opportunities in the U.S. for PV) and the UPVG (Utility PV Group), which work cooperatively with industry groups to accelerate PV market penetration. For example, in FY 1996 these programs will work together to accelerate the successful transition of low-cost thin film photovoltaics technology to yield low-cost manufacturing and near-term commercial PV products. PVMaT will complete the first round of process-specific research this year, continue research on cell and module efficiency, and enter its final phase with the initiation of System and Component Module Manufacturing Technology projects this year. Since overall efforts of this very successful program are winding down, we are requesting $1.4 million less this year, for a total of $17.6M.

SOLAR THERMAL

The budget request of $33.9 million for Solar Thermal Energy Systems is divided between utility and industrial programs. Of this amount, $26.1 million is directed to solar thermal power programs for utility and other power-producing applications. The remaining $7.9 million will be spent on industrial solar detoxification activities.

In the utility sector, the Solar Thermal Power Program works to develop new utility generating systems with higher efficiency and reliability for greater availability and dispatchability (power towers); distributed systems with high modularity (25 kWe dish/engine systems); and off-grid systems having both domestic and export potential (7.5 kWe dish/Stirling engine systems). We are requesting $19.2 million for these programs, which is a small increase ($2.3M) over FY 1995.

In FY 1996, we will finalize construction of Solar Two, begun in 1992 with a consortium of eight U.S. utilities led by Southern California Edison. The project continues at a level pace, with DOE funding of $2.1M. Solar Two is a $48.6 Million, 50/50 cost-shared cooperative project with DOE and industry to convert an existing 10-MWe water/steam power tower to a higher-efficiency molten salt system that can meet both peak and intermediate power demands. The molten salt power design is highly efficient in that once heated the retained heat energy can continue to produce electricity despite a temporary lack of sunlight. As a result, a facility will not repeatedly fail to generate electricity simply because of transient cloud coverage or as soon as the sun sets. By January 1996, Solar Two will be fully operational and validation testing (2-3 years planned) will begin to provide critical results on reliability, operation and maintenance. This data will be used to develop a plan for commercializing power towers in the early s. A team of utilities is already expected to bid on a 100 MWe solar thermal power plant in 1998 as part of the new Solar Enterprise Zone to be established at the Nevada Test Site.

Similarly, both the 25 kW and the 7.5 kW systems are industry-driven, 50/50 cost-shared programs that will be continued in FY 1996. Funding is up slightly ($1.7M.). The 25 kW project is expected to result in operational prototype installations exceeding 1MW in size. A key program goal is to achieve commercial introduction by industry in all 3 sizes before the year 2000.

WIND ENERGY

The FY 1996 funding request of $49.8 million for wind programs represents a small increase of $2.7 million. The increase will enable additional focus on development of the Next Generation Wind Turbine prototypes for deployment after 2000 and support verification efforts on the advanced turbines that will begin limited commercially availability this year. The price of wind energy has dropped substantially, from 40 cents a kilowatt hour in 1980 to as low as 5-6 cents today, within range of the 3-5 cent average production cost of conventional electricity. Wind is already producing enough electricity for 1 million Americans, and continued R&D is projected to bring costs down to 4 cents or less by the turn of the century. We estimate that by the year 2000, 3000 MW of new wind capacity will be installed and over 3000 new jobs will be created. In FY 1996, DOE's wind programs will stimulate up to 150 MW of new installed capacity from our collaborative programs with industry and make 6-7 new advanced wind turbines available for domestic and international markets. To gain marketplace acceptance, however -- and this means not only the utilities, but also the PUCs and other regulatory bodies, financial lending institutions, and the general public -- we will partner with industry to prove the technologies through up to 20 targeted deployments in various regions across the country, with a minimum 50% industry cost-sharing.

BIOMASS POWER

We are requesting $33.2 million for utility-related Biomass Power programs in 1996. Integrated bioenergy projects may provide significant benefits to the U.S., including rural development, job creation, and an opportunity to significantly reduce the nearly $2 billion in annual Federal agricultural subsidy payments through the introduction of alternative energy crops. As a result of anticipated legislative revisions in the upcoming 1995 Farm Bill, pending implementation of Phase II of the Clean Air Act Amendments, and the great need to stimulate self-sustaining rural economic development, a window of opportunity currently exists that can provide significant near-term benefits for the Nation. We will continue the DOE/USDA collaborative Energy Partnerships/Biomass Power Initiative in FY 1996, which focuses on demonstrating the economic and environmental viability and sustainability of integrated feedstock production and power conversion technologies through partnerships with farm communities to produce reliable supplies of biomass feedstocks and cost-competitive electric power. A requested $15.1 million increase and will be primarily used to fund the multi-agency (DOE, USDA, EPA, and White House Office of Science and Technology Policy) BioEnergy Initiative (BEI) which is focused on the replication of integrated biomass feedstock production and bioenergy conversion facilities to ensure total system cost-competitiveness. The goal of the BEI is to achieve operational prototype biomass power plants by the year 2000, with 2005 as the target for commercially viable bioenergy plants. The greatest portion of these dollars -- over 70% will be used in not-less-than 50/50 cost-shared projects with private sector partnerships. Although DOE has confirmed the strong private-sector interest in deploying integrated bioenergy projects, Federal involvement is necessary to buy-down the perceived risks associated with first-of-a-kind deployments. We believe this is an especially attractive investment since biomass power projects can be introduced as repowering projects in aging coal-fired facilities.

Several significant solar thermal projects also fall within this category, for which development of these systems is cost-shared 50/50 with an industry consortium led by Cummins. SolMat, begun in FY 1994, and patterned after the very successful PVMaT program, also receives a small increase in our FY 1996 request. SolMaT engages in 25% industry cost-shared projects to improve manufacturing productivity, cost-competitiveness, and quality control improvements needed to help the United States retain its status as the worldwide manufacturing leader.

GEOTHERMAL

The Geothermal Systems request for FY 1996 is slightly decreased at $37.5 million (-$0.3) and completes several technology development efforts that clearly support significant system cost reductions in the near term related to drilling, power plant, and materials technologies. The proposed program represents continuing cooperative efforts with industry to reduce the cost of power generated from moderate temperature geothermal resources by 30% by the end of this decade, leading to an expansion of the domestic geothermal generating capacity to 3500 MW and a 1000MW per year share of the international geothermal markets in the same timeframe. In FY 1996, program efforts will conduct activities to improve geothermal energy conversion for direct, electric power and heat pump uses and conduct studies of the pressure decline problems at the Geysers geothermal energy pipeline project (+$7.0M). The request also includes decreases in exploration, advanced drilling, and reservoir technology (-$3.1).

ELECTRIC ENERGY SYSTEMS

The budget request of $41.6 million for Electric Energy Systems is up only slightly (3%) and continues to address both the changing nature of the industry and carry out the requirements of the Energy Policy Act. Public concern regarding possible health effects from exposure to electric and magnetic fields (EMF) drives the DOE program to conduct health effects research, exposure characterization, field management, and communication in close cooperation with the National Institute of Environmental Health Sciences. To help address this concern and also simultaneously improve efficiency, the Reliability Research element is directed toward developing advanced technologies that can enable the existing transmission system to carry greater leads, reduce the need for new lines, and provide increased capacity and flexibility over the entire transmission and distribution system through real-time control technology.

In FY 1996, DOE will complete analysis of high phase order alternating current transmission in a collaborative project with the utility industry. This technology could lead to AC transmission systems that have 40-70% more capacity than conventional systems. As another near-term option that could significantly increase capacity, DOE's collaborative power electronics development efforts will lead to the operational test of lower cost (40-59% lower) high voltage direct current (HVDC) transmission systems beginning in FY 2000.

The Systems and Materials element has achieved significant progress toward developing practical high-temperature superconductivity technology, with payoffs anticipated within the next 5-10 years. The potential for energy efficiency increases is huge. For example, projections indicate that by just replacing today's conventional large motors (125+ horsepower) with superconducting designs, more than 1/2 Quad of energy per year would be saved. Successful HTS devices will also translate into widespread efficiency improvements in generation, transmission, distribution, and other end uses. In compliance with EPACT, DOE has entered into collaborative ventures with industry, both through CRADAs and the Superconductivity Partnership Initiative (SPI). Through a unique teaming structure involving component suppliers, manufacturers, and potential users, DOE cost shares (50/50) projects to develop critical products such as motors, generators, current limiters, and electric transmission cables. Industry views DOE participation as critical if the United States is to capture a significant share of the worldwide market potential for sales of products incorporating superconductive components. The Department of Commerce estimates that the worldwide market will be $8 billion by the year 2000, and an astounding $150 billion by 2020.

ENERGY STORAGE

The FY 1996 Energy Storage Systems request of $6.0 million will maintain level funding for development and deployment of battery storage systems for utility requirements, particularly for those identified in distributed utility scenarios. Utilities are increasingly recognizing that distributed storage systems will be important part of their future resource mix. By 2010, program estimates indicate that up to 100 GW of new battery storage capacity could be deployed -- the equivalent of up to 15% of the 1993 installed generating capacity. FY 1996 activities will include continued developmental work on advanced modular systems with standardized power conditioning subsystems and initiate a limited number (1-2) of proof-of-concept tests of modular systems at selected utilities that can meet short term power requirements of 2MW for 10 seconds.

TRANSPORTATION BIOFUELS

The budget request for biomass fuels development for transportation applications is $38.2 million, an increase of $3.156 million. Through the success of this program it is estimated that by year 2010 there will be a 195,000 net increase in jobs, 142 million barrels of oil substituted annually, and energy cost savings exceeding $1.4 billion.

Program	FY 1995	FY 1996	Change
Biofuels	$35.0	$38.2	$3.2

The principal research goal of the transportation biofuels program is to support efforts that will lead to the deployment of ethanol fuel, and other biofuels such as biodiesel and methanol, without the need for Federal subsidies. Achievement of this goal depends on making feedstocks and conversion technologies economically competitive. This will be accomplished through the utilization of low-cost waste feedstocks, energy corp research, and improvements in microorganisms, enzymes, and process design.

The transportation biofuels program has conducted research on the conversion of biomass to transportation fuels since 1980. During this time the projected "plant gate" cost of biofuels has been reduced significantly, from $3.60/gallon in the early 1980s to $1.22/gallon in 1993. In 1994, a new genetically engineered organism, Zymomonas mobilis, was developed at the National Renewable Energy Laboratory (NREL) that has enhanced fermentation capabilities that increase yields of ethanol. This bacterium and new genetically engineered cellulase enzymes will be tested at the bench and pilot scales. It is anticipated that these new technologies will substantially reduce the cost of ethanol below $1.22/gallon, making it cost competitive with gasoline and diesel fuels.

Near-term program activities also include integrating current technologies into complete processes, scaling up these processes in the one-ton-per-day process development unit and other pilot scale plants, and supporting the development of larger scale demonstration and commercial facilities. The ethanol pilot plant was completed in 1994 and is now being used with Amoco Corporation to test ethanol technology on an engineering scale in preparation for initiating the design of the first ethanol demonstration plant in late-1995 and the construction of these plants in 1996. The success of Amoco achieving the capability to move forward with the commercialization of biomass ethanol is without question a result of the close working relationship with the Biofuels program. This relationship has provided for the significant leveraging (25% to 50%) of DOE funds with industrial funds.

Energy crop research has identified three model energy crops (switchgrass, hybrid popular, and hybrid willow) which will be improved at integrated crop development R&D centers. Efforts are also taking place to move these the energy crops into the commercial arena. Through Agenda 2020, DOE's compact with the American Forest and Paper Association, it is anticipated that there will be a strengthening of research ties between major pulp and paper companies and DOE to develop short rotation forestry. Eight agreements are in place with various companies to develop business plans examining these crops for the co-production of fuels, electricity, fiber, and chemicals at many sites in the U.S. Developing these crops for uses other than fuels will lay the foundation to marry these crops to biofuels conversion technologies as more advancements are made to both reduce production and conversion costs.

REGIONAL BIOMASS PROGRAM

The FY 1996 request of $3.9 million for the Regional Biomass Program is approximately $0.9 million less then the FY 1995 appropriation. The regional biomass program will continue to increase the production and use of biomass energy resources and transfer reliable information to biofuel energy users.

Program	FY1995	FY1996	Change
Regional Biomass	$4.8	$3.9	-$0.9

The Regional Biomass program is focused on regionally-specific needs and opportunities which are best defined at the local level. Although the FY 1996 decrease will reduce some field demonstrations of biodiesel development, on-farm biogas to energy systems, and landfill and waste water treatment biogas-to-energy systems, the program will focus on identifying the best opportunities for accelerating market acceptance of biomass technologies at the local level.

SOLAR TECHNOLOGY TRANSFER

The FY 1996 request of $17.8 million for Solar Technology Transfer is approximately $4.6 million less then the FY 1995 appropriation.

Program	FY1995	FY1996	Change
Solar Technology Transfer	$22.4	$17.8	-$4.6

This program is made up of three components: Commercialization Ventures, Information and Communications/ Outreach and Education, and Tribal Government Grants. The Commercialization Ventures program, for which we are requesting $10.8 million, intends to utilize the financial intermediary structure to facilitate implementation of the program. The intermediary will review projects for funding and assist in the preparation of business plans for potential projects. Also, the program will expand its network of private sector financial institutions willing to independently and/or cooperatively fund emerging renewable technologies. The information and communications/outreach and education component, for which we are requesting $4.0 million, includes the operation of our Customer Service Center and the technical information program. The Center's Energy Efficiency and Renewable Energy Clearinghouse (EREC) was established in January 1995 to provide the public with timely, accurate information. The Center features a toll-free information number (1-800-DOE-EREC) to provide callers with "one-stop" information on energy efficiency and renewable energy technologies and programs. This effort is the consolidation of the former Conservation and Renewable Energy Inquiry and Referral Service (CAREIRS) and the National Appropriate Technology Assistance Service (NATAS) which was funded under the Energy Conservation Appropriation. The technical information program, which develops and disseminates technical information products (brochures, factsheets, and videos) for local governments, educators and trade professionals, will continue those efforts and will continue to support the Customer Service Center.

The last component is the Tribal Government Grants for which we are requesting $3.0 million. This program will provide funds to tribal governments to carry out projects to evaluate the feasibility of and encourage the adoption of renewable and energy efficiency projects on Indian reservations in response to the Energy Policy Act of 1992. Because of the significant number of tribes interested in this program and the many worthwhile projects we will continue to select projects based on a competitive solicitation.

SOLAR INDUSTRIAL

Program	FY 1995	FY 1996	Change
Solar Industrial	7.6	7.9	+0.3

Process Heat	2.2	.8	+1.1
Advanced Applications	1.77	3.53	-0.74
Detoxification - Industrial Waste	3.4	3.35	-0.05
Capital Equip.	0.2	0.2	- -

The solar-industrial program is designed to reduce cost of solar applications for industry and commerce. One promising success of this program is a method to detoxify industrial wastes using concentrated sunlight.

FY96 reflects a repositioning of effort to support process heat projects (mostly hot water) with states and other federal partners, using technologies developed in prior years. The $1.1 million increase is offset with decrements for a net increase of just over $0.3M. FY96 funds support a scale-up in cost-shared deployment in conjunction with state energy offices, military bases and other federal partners such as EPA. In addition, this budget supports expanded cooperation with FEMP.

MUNICIPAL SOLID WASTE

Program	FY 1995	FY 1996	Change
Municipal Solid Waste	1.5	3.1	+1.6
Anaerobic Digestion	1.122	1.177	+0.055
Landfill Gas	0.4	0.4	no change
CCAP Landfill Gas	0	1.5	+1.5

The primary change for FY1996 in this area of our budget is an increase of $1.5 million to better characterize the nature of landfill gas emissions and to better determine the global warming potential of landfill gases. This funding will support data collection at 6 to 7 existing landfills; results will be generally applicable to about 6000 landfills nationally, although specific landfill components will affect the composition of gasses from site to site. The number of partners and the ability to leverage resources are yet to be determined, pending negotiated agreements with landfill operators. An initial set of sites is selected and letters of interest are already in-hand. This effort will result in more meaningful characterizations of off-gassing landfills which relate directly to the nation's ability to productively turn garbage into an energy resource. This effort envisions flat funding for 5 years with the potential of tripling the number of sites where landfill gas is captured from the current 164 to 500-600 by the year 2000.

Anaerobic digestion is essentially flat for FY1996 to support construction of a pilot plant to demonstrate a unique National Renewable Energy Laboratory (NREL) process in American Samoa. The reactor is to be proven in Los Angeles in the first quarter of FY1996. A primary benefit of this investment is demonstrating an important NREL process that results in "high-solids" sludge (25-45%). High-solids content is important because it greatly improves the energy efficiency of processing typical sludges with only about 2% solids. The NREL process has national potential.

BIOMASS FOR COGENERATION

Program	FY 1995	FY 1996	Change
Biomass Cogeneration	$0	$1.98	$1.98

An increment of $1.984 million is requested in FY1996 to initiate the Office of Industrial Technologies (OIT) portion of the Biomass initiative for the Advanced Turbine program. The thrust of this effort is to "ruggedize" the turbines so that they may use biogas as a fuel. Ruggedizing is required to resist corrosive qualities in biogas and potential damage from particulate matter originating in the gasifier. The corrosive effects of biogas are caused by nitrogen and phosphorus in living tissue and affect all turbine parts exposed to the fuel gas: combustor, nozzle, blades and transition pieces. Particulate matter damage could be caused in the event of failure of newly developed "hot" filters situated between gasifier and turbine. This effort supports a the Bioenergy Initiative described earlier in the testimony.

SOLAR BUILDING TECHNOLOGY

The budget request for the Solar Building Technology program remains virtually unchanged in FY1996 at a level of $4.7 million. The program, focused primarily on solar water heating technology, will work closely with utilities and others to deploy today's systems while continuing research designed to improve the cost-effectiveness and reliability of tomorrow's systems.

Program	FY 95 ($000s)	FY96	Change
Solar Building Technology Research	$ 4610	$ 4657	+$ 47

While the program is focused primarily on solar domestic hot water systems (SDHW), it also includes research on building-integrated photovoltaic systems (BIPV) and active solar space heating. Deployment efforts for the water heating systems are focused through the Utility Solar Water Initiative(USH$_2$O). This initiative partners DOE with American Public Power Association, the Edison Electric Institute, and more than 70 utilities. These utilities are starting to implement aggressive programs to introduce the solar hot water systems, beginning with Sacramento Municipal Utility District (SMUD) with 6-12 additional utility programs anticipated in FY96. DOE is also continuing work with the Solar Rating and Certification Corporation, an industry-supported voluntary standards body, to provide the technical support and assistance necessary to certify existing systems, which will improve the reliability and consumer understanding and confidence in today's systems.

Complementing the solar hot water deployment components is research in two areas. First, we are developing strategies to mitigate the reliability issues associated with today's solar hot water systems, including scaling and deposition, overheating and freezing, and materials reliability. Second, the advanced concepts component of the program funds research to lower the cost of systems, with a goal of reducing the payback for the systems in most areas to 5 years. More than 1 million systems have been installed since the mid-70's. As the program works with private partners to improve the technology and deploy new systems, we anticipate additional sales of 5 million systems over the next 10 to 15 years, generating consumer savings of nearly one-half billion dollars in annual savings.

The building-integrated photovoltaic component of the Solar Building Technology program will focus its efforts on working together with industry partners and DOE's photovoltaic program to integrate innovative new products in building's design, structure, and control systems. The program will feature a design competition and demonstration projects initiated in FY95. In solar space heating, we will continue research on advanced systems such as the transpired air collector system which we assisted an industrial partner to produce. The technology was awarded an "R&D 100" award from R&D magazine, as well as a 1994 "Best of What's New" award from Popular Science magazine.

SOLAR INTERNATIONAL

The DOE Solar International Program is requesting $29.2 million in FY 1996 to increase penetration of our renewable energy technologies into the ever expanding overseas markets. The estimates of the size of these markets are staggering: up to $150 billion for renewables this decade alone. An increase of only one-third of one percent in market share by U.S. firms due to DOE assistance would equal the entire budget of the Office of Energy Efficiency and Renewable Energy. Overseas is where the markets are and U.S. industry wants to capture them; rural areas of developing countries provide some of the most cost-effective applications of renewable energy technologies.

Program	FY 95	FY 96	Change
CORECT	$1.9 M	$1.9 M	- -

Americas' 21st Century	**$3.5 M**	**$5.0 M**	**+$1.5 M**
LDC Training	**$0.5 M**	**$1.0 M**	**+$0.5 M**
USIJI / Country Studies I	**$3.2 M**	**$14.5 M**	**+$11.3 M**
Export Initiative		**$4.7 M**	**+$4.7 M**
Country Studies II	**- -**	**$2.0 M**	**+$2.0 M**
TOTAL	**$9.1 M**	**$29.2 M**	**+$20.0 M**

The DOE Solar International Program has several long term goals, to ensure that U.S. firms are a major part of TOMORROW's energy market: (1) increase exports to sustain growth in U.S. industries while creating new U.S. jobs; (2) identify and minimize market barriers in innovative, cost-effective ways; and, (3) increase number and extent of private sector partnerships and leveraging of foreign funding. U.S. firms want to export but need modest assistance to fully utilize existing government programs, acquire financing, identify projects and understand markets. Through partnerships with industry and financial institutions such as the World Bank, DOE has been able to leverage its small investments in commercializing renewable energy technologies abroad. All of this results in greater profits and more jobs for American business as well as a cleaner environment and more sustainable development paths for many other countries.

The DOE Solar International Program uses a variety of strategies to seize and/or secure a greater U.S. market share by addressing trade and other market barriers that continue to impede the fundamental acceptance of the merits of renewable technologies. It coordinates Federal export activities and leverages available Federal funds to the greatest extent possible. It fosters the development of commercial financing resources in lieu of governmental assistance and uses joint ventures with appropriate partners to ensure project "buy-in". It also develops appropriate training assistance for local energy decision-makers.

The FY 1996 request is $20.0 million higher than in FY 1995. The focus will be industry-requested export assistance as developed through the CORECT strategic planning process and elimination of market barriers, especially those that inhibit two-way flows of information. Roughly a third of the FY 1996 increase ($6.2 million) is in two similar programs that expand into new markets: Americas' 21st Century and the New Export Initiative. These programs will implement the successful Brazilian model into other countries in Latin America and launch the entire design in Asia/Pacific, Eastern Europe and Africa. Activities will focus on cost-shared joint ventures. Lesser Developed Country (LDC) Training will receive an additional $0.5 million to implement Section 1203 of the EPAct and provide training in energy policy development, as well as "hands on" training for energy decision-makers and operators worldwide. Funding remains constant for CORECT (the Committee on Renewable Energy Commerce and Trade), which has been instrumental in developing and capitalizing on a dialogue with U.S. renewable energy businesses to determine how best the Federal government can assist businesses in worldwide marketing.

Over half of the increase ($11.3 million) will expand the U.S. Initiative on Joint Implementation and associated Country Studies programs ($2.0 million). The USIJI will significantly increase project development in partnership with the private sector and work with partner governments to facilitate these projects. The connection to the Rio treaty makes these activities in other countries especially high profile. Program activities also will focus on building infrastructures that support the adaption of U.S. technologies and assisting private industry through Sustainable Development Project demonstrations in instituting greenhouse gas emissions mitigation improvements internationally. The Country Studies programs back up this effort by ensuring that developing countries produce their own greenhouse gas emissions inventories and mitigation plans and by creating opportunities to effect sustainable development during critical infrastructure design and development stages.

Our Solar International Programs have already logged significant successes. Since 1993, Renewable Energy in the Americas (REIA), jointly run through CORECT and Americas's 21st Century, has identified over 175 projects valued at $1.3 billion throughout Latin America for which the U.S. renewable energy industry is the primary participant. In Indonesia, CORECT was instrumental in assisting U.S. businesses to identify the market potential of $1.0 billion in geothermal technology sales. CORECT expended under $100 thousand over a two year period to support this effort. Renewable Energy for African Development (REFAD) launched a pilot project consisting of 200 systems with the potential of 200,000 system sales. Initial cost per system is $500 leading to potential sales of as much as $100 million. Through the Energy Efficiency and Renewable Energy Agreement signed in December 1994, the Chilean government has committed to an initial investment of $3 million in these technologies for rural development; the U.S. provided only $500,000 as seed money for this project.

IN-HOUSE ENERGY MANAGEMENT

In FY 1996 the In-House Energy Management (IHEM) program has been moved to the EE budget from DOE's Field Management budget. IHEM is a new budget item for EE but not for the Department of Energy. The program has reduced energy consumption per square foot in the Department's buildings by 24 percent as compared to FY 1985, thereby beating the FY 2000 goal of the Energy Policy Act of 1992 by more than 4 years. The budget request of $28.8 million, down from $30.7M in FY 1995, will provide a minimum annual dollar savings of $5 million, which can be increased by greater than 20 percent or $1 million per year through incentives for chiller replacement and increased use of Energy Savings Performance Contracting.

This budget also includes $13.1 million to fund approximately 50 small energy efficiency retrofit projects. When complete, these programs will have a payback slightly greater than three years. These funds will also provide for the design and construction of a life-cycle cost effective project to demonstrate a new or emerging energy savings technology that advances the state-of-the-art in energy efficiency and the generation and use of energy at a DOE site.

In addition, the In-House Energy Management Program will initiate an experimental two-year program to provide joint funding of $10 million with other DOE organizations for integrated chiller replacement projects that include other cooling-load reduction measures. This will improve energy efficiency, allow chillers to be down-sized to operate more efficiently while reducing investment cost, and support the regulatory phase-out of chlorofluorocarbons.

CONCLUSION

In conclusion, Mr. Chairman, as we move toward the next decade we believe that our programs:

-will increase U.S. renewable energy use by at least 1 quad by 2000 and nearly 4 quads by 2010 and

-will result in energy cost savings to utilities, businesses and consumers of $3 billion in 2000 and $7 billion by 2010.

These benefits will occur at the same time we are lowering our foreign trade deficit, reducing our dependence on foreign oil, and reducing the environmental damages caused by energy consumption.

We are making our programs work better, because we know they will help America work better. We are convinced that America will be more innovative, more competitive, more prosperous and more healthy if Congress affirms the critical contribution these programs make to building a strong economy.

Thank you for this opportunity and I will be happy to answer questions.

Attachment

FY 1996 HIGHLIGHTS CATEGORY BREAKDOWN
(Dollars In Thousands)

Technology Advancement	
Photovoltaic Energy Systems	
Fundamental Research	7,741
Advanced Materials and Devices	24,812
Capital Equipment	3,970
Solar Thermal Systems (OUT only)	
Technology Development	6,379
Capital Equipment	496
Biofuels Energy Systems (OUT only)	
Thermochemical Conversion	1,894
Capital Equipment	100
Wind Energy Systems	
Applied Research	8,900
Capital Equipment	1,489
Solar Program Direction	9,460
Geothermal Systems	
Drilling	5,146
Reservoir Technology	6,647
Environment	8,118
Program Direction	1,000
Capital Equipment	397
Hydropower	
Hydropower Development	904
Program Direction	90
Hydrogen	7,444
Electric Energy Systems	
Reliability Research (T&D)	6,153
Systems and Materials Research (HTS)	
Materials (+ High Field Research)	9,870
Energy Storage Systems	
Utility Battery Storage (Tech. Dev.)	3,656
TOTAL	**114,666**

Industry Partnership & Deployment	
Photovoltaic Energy Systems	
Collector Research & Systems Development	51,606
Solar Thermal Systems (OUT only)	
Commercial Applications	19,190
Biofuels Energy Systems (OUT only)	
Systems Development	31,226
Wind Energy Systems	
Utility and Industry Programs	39,431
Solar Program Support	
REPI	2,988
Climate Challenge	2,000
Geothermal Systems	
Exploration	4,169
Conversion	12,050
Electric Energy Systems	
Systems and Materials Research (HTS)	
Devices and Systems	14,842
Energy Storage Systems	
Utility Battery Storage	2,000
Program Direction	350
TOTAL	**179,852**

Integration	
Solar Program Support	
Evaluation and Planning	2,357
Resource Assessment	
Resource Assessment	4,268
Capital Equipment	397
Electric Energy Systems	
Electric Field Effects (EMF)	9,923
Program Direction	850
TOTAL	**17,795**

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BIOGRAPHY

DR. PETER S. FOX-PENNER

Peter S. Fox-Penner was appointed Principal Deputy Assistant Secretary for Energy Efficiency and Renewable Energy at the U.S. Department of Energy on October 20, 1993. In this position, he is responsible for directing the planning, implementation, and management of major projects and programs in the Office of Energy Efficiency and Renewable Energy. As Principal Deputy Assistant Secretary, Dr. Fox-Penner also acts on behalf of the Assistant Secretary in her absence.

The Office of Energy Efficiency and Renewable Energy's annual budget exceeds $1 billion dollars. Its programs range from electric utility integrated resource planning to global climate initiatives and the Administration's Clean Car Initiative.

During the 1992 Presidential Campaign, Dr. Fox-Penner served as an energy and environmental advisor on a wide variety of issues. In addition to speaking engagements and briefings, he was active in Environmentalists for Clinton-Gore.

Prior to coming to the Department of Energy, Dr. Fox-Penner was a Vice President of Charles Rivers Associates, Inc. A specialist in regulated industries and energy and environmental policy, Dr. Fox-Penner has advised numerous public and private clients and has published a number of articles and books. His past assignments include analyzing natural resource damages, integrated resource planning and demand-side management, energy studies of renewable fuels, and assignments related to international energy policy, U.S. petroleum use, and alternative fuels. In addition to his consulting activities, he has provided expert witness testimony before the Interstate Commerce Commission, Federal Courts, the Federal Energy Regulatory Commission, and a number of State public service commissions.

From 1980 to 1983, Dr. Fox-Penner served as Chief Engineer in the Illinois Governor's Office of Consumer Services. Prior to this, he worked for the University of Illinois Energy Research Group, a pioneering energy research center. During this period, he was a founder and leader of the Prairie Alliance, a grassroots environmental group.

(more)

In 1989, Dr. Fox-Penner earned a Ph.D in Economics from the University of Chicago. His doctoral thesis concerning energy conservation and industry structure in relation to PURPA appeared in the Journal of Law and Economics. He received his Bachelor's degree in Electrical Engineering from the University of Illinois in 1976 and a Masters of Mechanical Engineering in 1978.

During his professional career, Dr. Fox-Penner has become a member of the Advisory Board of the Center for National Policy: an Associate Member of the American Bar Association; an Associate Member of the American Economic Association; the International Association of Energy Economists; the Association of Demand-Side Management Professionals; the Association of Energy Engineers; and other professional groups.

He is a native of Chicago and long-time resident of Boston. Dr. Fox-Penner now lives in Virginia with his wife, Susan Elizabeth Vitka, and daughter Emily.

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BIOGRAPHY

Karl R. Rábago
Deputy Assistant Secretary, Utility Technologies
Energy Efficiency and Renewable Energy

Karl R. Rábago was appointed Deputy Assistant Secretary for Utility Technologies, Office of Energy Efficiency and Renewable Energy, U.S. Department of Energy on January 3, 1995. In this position, he is responsible for the management of the Department's utility sector programs in renewable energy technologies and systems, electric energy systems, energy efficiency, and integrated resource planning.

Before coming to Washington, D.C., Mr. Rábago served as a Commissioner for the Public Utility Commission of Texas from 1992 through 1994. He also served as Co-Chair of the Texas Sustainable Energy Development Council and as Vice-Chair of the Energy Conservation Committee of the National Association of Regulatory Utility Commissioners.

Mr. Rábago has been active in integrated resource planning, renewable energy and energy conservation issues. He sat on the Coordinating Council of the Photovoltaic Collaborative Market Project to Accelerate Commercial Technology, the Southern States Energy Board Integrated Resource Planning Task Force and the Advisory Board of the Environmental Institute of Houston, University of Houston.

From 1990 to 1992, Mr. Rábago was a law professor at the University of Houston Law Center, where he taught environmental and criminal law. Rábago served as an officer in the United States Army, obtaining the rank of Major prior to his honorable discharge in 1990. A graduate of the Army's Airborne and Ranger schools, Rábago held diverse assignments, including service as a member of the faculty at the United States Military Academy at West Point, a criminal prosecutor and defense counsel, and an armored cavalry platoon leader.

Mr. Rábago earned a bachelor's degree in Business Management from Texas A&M University in 1977 and a law degree, with honors, from the University of Texas in 1984. In addition, he has two post-doctorate Master of Laws degrees, one in Environmental Law from Pace University in New York, and another in Military Law from the U.S. Army Judge Advocate General's School in Virginia.

Mr. Rábago and his wife Pam have three children--Tim, Troy, and Kara.

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TUESDAY, MARCH 14, 1995.

NUCLEAR FISSION

URANIUM SUPPLY AND ENRICHMENT ACTIVITIES

WITNESS

RAY A. HUNTER, ACTING DEPUTY DIRECTOR, OFFICE OF NUCLEAR ENERGY

OPENING REMARKS

Mr. MYERS. The committee will come to order.

This afternoon we are pleased to welcome Secretary Hunter as an assistant, I guess, substitute. We are pleased to have you this afternoon on nuclear fission. Your entire printed statement will be in the record, and you may proceed as you care.

Mr. HUNTER. Thank you, sir. Dr. Terry Lash, who is the Director of the Office of Nuclear Energy, isn't here today because of a family illness, so I am acting in his stead.

Mr. MYERS. We are sorry about that. Hope everything turns out okay.

BUDGET OVERVIEW

Mr. HUNTER. Thank you.

The fiscal year 1996 budget request from the Office of Nuclear Energy is $425.1 million. This amount represents a 9 percent decrease from the planned fiscal year 1995 expenditures when we include funding provided by the U.S. Agency for International Development. This figure does not include the Naval Reactors funding which we will discuss in detail at a later time. I would like to spend a few minutes to discuss the major elements of our program and in the formulation of our fiscal year 1996 budget request.

The Office of Nuclear Energy has undergone extensive changes over the last two years in terms of downsizing. We have gone from 258 FTEs in headquarters in fiscal year 1993; in this budget we will support 154 FTEs in headquarters. It is a leaner, more focused organization with the primary missions of maintaining the nuclear energy option in the United States and enhancing nuclear safety worldwide.

We also conduct critical nuclear science activities that would not be profitable for the private sector, such as providing important isotopes for medical research, industry and industrial applications. Our fiscal year 1996 budget reflects our efforts to further concentrate our attention on these priority activities.

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ADVANCED LIGHT WATER TECHNOLOGY PROGRAM

Among the key programs we are conducting which will help maintain the nuclear energy option for the U.S. is our Advanced Light Water Technology Program. This is a cooperative and cost-shared program with industry. Currently, the program has four advanced light water reactor plants designs under review for certification by the Nuclear Regulatory Commission.

Major milestones in this program were achieved in June and July, 1994, when NRC issued final design approval of the two large plant designs—the 1,300 megawatt General Electric advanced boiling water reactor and the 1,350 megawatt ABB Combustion Engineering System 80+. We anticipate NRC design certification of these two plant designs by the end of 1995 or early 1996.

We are also conducting a cooperative, cost-shared program to assist U.S. electric utilities to develop the technical basis for safely extending the life of the currently operating reactors. This program will help to keep current generation nuclear energy plants operating until well into the next century and help assure that they will operate safely.

INTERNATIONAL NUCLEAR SAFETY

We are also working with other U.S. agencies and other countries and international organizations to enhance nuclear safety internationally. The centerpiece of our program is our participation in the international effort to improve nuclear safety in countries that operate Soviet-designed nuclear plants.

Substantial concern exists over the continued operation of Soviet-designed reactors that do not meet western standards of safe design, manufacture or operation. In addition to human tragedy and environmental consequences, major nuclear accidents in these countries would critically wound their economic and national stability and present unwelcome, difficult challenges to U.S. foreign policy. Major accidents would also cripple opportunities for U.S. manufacturers to construct new nuclear energy plants in the U.S. and abroad.

Our effort is a highly focused program that seeks not to provide financial assistance to these countries but instead taps the expertise of U.S. and indigenous industry and technical resources to provide both near-term safety enhancements and longer-term improvements in safety culture.

Near-term efforts include the installation of U.S. hardware in Soviet-designed plants. Longer-term activities, such as helping these countries to establish western-style laws, regulations, operating procedures, training and quality programs are critical to achieving lasting improvements in nuclear safety culture and infrastructure.

The program seeks to transfer to these countries the capability to maintain safety improvements and manufacture safety-related equipment, while also benefiting the U.S. in reverse technology transfer.

In addition to the 66 operating civilian nuclear energy plants in Russia, Ukraine, Central and Eastern Europe, the Russian republic continues to operate three reactors which produce weapons-grade plutonium. We are working with other U.S. Government agencies to implement a U.S.–Russian agreement on the shutdown of these reactors. The Office of Nuclear Energy also leads the Department's participation in the international effort to achieve shutdown of the Chernobyl nuclear power plant.

Funding for these international activities through fiscal year 1995 is provided to the Department of Energy by the Agency for International Development. Much work is yet to be done. In order to sustain our effort and reduce bureaucratic delays for fiscal year 1996, we are requesting that the funding be provided directly to the Department of Energy. This change is reflected in our fiscal year 1996 budget request.

ISOTOPE PRODUCTION AND DISTRIBUTION PROGRAM

Another important activity is our Isotope Production and Distribution Program. This program provides radioactive and stable isotope products and associated services through a widely varied domestic and international market. These products and services are used for research, development, biomedical and industrial applications.

Our program was recently restructured, as reflected in the National Isotope Strategy and the fiscal year 1995 Energy and Water Development Appropriations Act. The program now operates with a revolving fund and maintains financial continuity through its revenues and annual appropriated funding. Our attention is now focused on quality of products and services, customer satisfaction, cost control, marketing, pricing stability and revenue collections.

In response to customer demands, we propose to establish a domestic production capability for molybdenum–99. This isotope, a precursor to technetium–99m, is the most critical of all nuclear medicine isotopes and is used in over 35,000 medical procedures each day in the United States alone. The United States is currently supplied by an aging reactor in Canada.

After an independent review, the annular core research reactor and associated facilities located at the Sandia National Laboratory in New Mexico were found to be appropriate for domestic molybdenum–99 production. If the results of an environmental assessment currently being conducted is positive, initial production should occur by late spring 1996, and Federal Drug Administration approval could be granted by the Fall of 1996.

ELECTROMAGNETIC SEPARATED ISOTOPES

A second important initiative, started in fiscal 1995 and scheduled to continue through fiscal 1996, is the operation of the calutrons at the Oak Ridge National Laboratory in Tennessee to produce electromagnetically separated isotopes. The calutrons are now operating and producing several stable isotopes used in medical applications.

We continue to evaluate opportunities for the private sector to cofund or invest in new ventures. Also, we will seek to divest ourselves from ventures that can be operated profitably by the private sector. We are committed to maintaining a strong organizational and financial basis for ensuring a reliable supply of both radioactive and stable isotopes for the United States.

DEACTIVATION OF LIQUID METAL REACTORS

The Office of Nuclear Energy performs other important functions, including the deactivation of the liquid metal reactors at the Hanford Reservation and at the Argonne National Laboratory-West, providing nuclear power systems for space exploration, and performing high-priority nuclear research and development. These and other items are detailed in our written statement and budget request.

UNITED STATES ENRICHMENT CORPORATION

One item I would mention before closing is our continuing relationship with the United States Enrichment Corporation. The Office of Nuclear Energy provides interim regulatory oversight of facilities operated by USEC and generally manages the interaction between the Department of Energy and the Corporation. We meet regularly with the Corporation officials and coordinate with them on a host of important matters.

The most urgent item of discussion is the privatization of USEC. The Office of Nuclear Energy fully supports USEC privatization efforts and will be an active participant in ushering this important initiative to a successful conclusion.

Thank you again for the opportunity to appear before you today, and I would be pleased to answer any questions.

[The prepared statement of Mr. Hunter appears at the end of the hearing record.]

REDUCED STAFFING

Mr. MYERS. Well, thank you very much, Mr. Hunter.

Several things are of concern here.

First, I guess we shouldn't be critical of your budget. The number of FTEs you have been able to reduce the last two years are something that a lot of agencies haven't been able to do, at least without some damage to the programs and some problem about being able to carry out their mission. I hope yours hasn't been affected that way. You have had a significant reduction in your outlook.

Mr. HUNTER. Yes, sir.

LIGHT WATER REACTORS

Mr. MYERS. As an example, you are going to one advanced light water reactor of all the options we have had. You explained a little bit about that, that you have had to terminate some because of the cost and some of the costs of continuing the research. Has that also gone into the fact that you have gone down to just one reactor now? A variation from that reactor—I know you have several different—Westinghouse, smaller boiling water reactor. You have some options. But, basically, it is the same system, though, isn't it?

Mr. HUNTER. With regard to the light water reactors, yes. But with respect to—and let me just, as a personal note, say that I haven't seen a reactor I didn't like—the gas reactor and the sodium reactor are good reactors in a design concept, but when we look for opportunities to move into the commercial arena, it just doesn't appear that either of those reactors are going to be something that would be competitive for the next 15 or 20 years, if not longer. We are still waiting for the next order of the light water reactor, and we just don't know when that is going to occur.

So it was a combination of budget constraints and, I think, looking realistically at what the market might be after the turn of the century and what could actually work in the marketplace. I think both of the other reactor concepts are faced with the financial condition of probably having to go through a prototype, and that would be a very expensive undertaking. We would expect major cost-sharing by the industry in this, and we certainly haven't seen any people volunteer to enter into such arrangement with us.

Mr. MYERS. Well, of course, using that analogy we wouldn't be building any. We wouldn't be doing any research because there is no prospect right now of anybody ordering a reactor, is there, whether it be an advanced light water reactor or a gas turbine or IFR or anything else? Nobody is buying any reactors or even indicating that they are likely to buy one, so if that is the reasoning——

Mr. HUNTER. Well, in the case of the light water reactor program, we have major cost-sharing from industry in the activity. The research that we are doing in development work and design work—for example, in our budget for fiscal year 1996 we are asking for approximately $49 million, but that is being augmented by $70 million from the private sector. We don't have anything analogous to that for any other reactor concept.

It is in that regard that we are trying to work in partnership with our utilities and our vendors to get standardized designs available for the future.

COST-SHARING RESEARCH

Mr. MYERS. I don't mean to be argumentative, but if we use the same analogy we will close down fusion right now because nobody is going to buy fusion for the next century, it doesn't look like, so why do we continue research on fusion and some of these others? That is out of your field, I know, but we will just close down a lot of them if we are waiting for somebody to order one, if that is the only thing we are planning for. I don't mean to be too critical, but I hate for us just to go down one road here.

The option that we have had in the past—of course, this committee has been burned. I must say we have been burned on the other side of it. DOE has taken us down a couple of paths that have been very expensive for the taxpayers and embarrassing to this committee. But it does seem to me like we ought to be looking for some other option, maybe a more passive, something.

It always appeared to me—and I am not making any case here—the modular type, a utility could buy one and then five years down the road they hook one up next to it. That seemed like a big advantage there. I know in the Westinghouse simplified boiling water reactor, that was one of the advantages there. I don't think it is modular, though. It does say it is passive in the safety.

Mr. HUNTER. Yes, and we are continuing to work on a cost-sharing basis on that particular design.

But when we start to shift coolant from water to sodium or gas, the development work and the potential for that to be available after the turn of the century diminish—and that is what we are keying our light water program to now is to bring that to a close by the end of this century and have it available for possible options by U.S. utilities, if they decide to purchase a reactor for the United States.

We also see opportunity in foreign markets. In fact, that may be where the next reactor is sold.

INTERNATIONAL SALES MARKET

Mr. MYERS. Well, can you sell to a foreign market?

Mr. HUNTER. We certainly have in South Korea, yes, and we have in Japan also.

Mr. MYERS. Recently?

Mr. HUNTER. I don't know what the last sale was, sir. I could get that information for you, but——

[The information follows:]

NUCLEAR REACTORS

The most recent reactors sold in South Korea are Yongwang 3 and 4 and Ulchin 3 and 4. Two additional plants are planned for construction at the Youngwang site. These reactors are all based on the ABB–Combustion Engineering (CE) System 80 1000 MWe pressurized water reactor (PWR) design. CE has a license agreement to allow the South Korean companies to use the design and manufacture the components of the reactor. For this agreement, CE receives a royalty fee. Although the South Koreans now provide the majority of the components for their plants, U.S. manufactured equipment is still required for 20–25 percent of nuclear components. CE is providing reactor coolant pumps, reactor core internals, control rod drive mechanisms, and some instrumentation and control equipment for the new South Korean plants.

Japan has six reactors currently under construction that will commence commercial operations within the next two years. Two of these reactors, Kashiwazaki Kariwa 6 & 7, are General Electric (GE) Advanced Boiling Water Reactor (ABWR) designs, manufactured through a joint venture with GE, Toshiba, and Hitachi where GE supplies the reactor and initial nuclear fuel load. Japan has eight additional reactor plants proposed for construction within the next ten years, six ABWRs and two PWRs.

Mr. MYERS. The world market, I know. For a while, I understood nobody is buying from us today because they can't license them.

Mr. HUNTER. I am sorry?

Mr. MYERS. NRC will not approve, I think, the reactors we have today. Maybe under the new program maybe we will be able to, but I understood our companies were not able to sell overseas today.

Mr. HUNTER. Well, we believe we had a very competitive proposal both by Westinghouse and I believe Combustion Engineering in regards to the Taiwan plants.

Mr. MYERS. Taiwan, they bought two, didn't they?

Mr. HUNTER. Yes, sir.

Mr. MYERS. The third one they bought from Japan, as I recall, instead of us because of the Nuclear Regulatory Commission—I believe I am right on that—several years ago. I am going back in my memory somewhat.

UNITED STATES ENRICHMENT CORPORATION

What about the U.S. Enrichment Corporation? You mentioned it there. Doesn't something have to be done this year? Some decision has to be made?

Mr. HUNTER. Let me turn to my notes, sir, if I could.

Mr. MYERS. It seems like the authority I thought had to be done this year. Some decision has to be made either to privatize——

Mr. HUNTER. Yes. There has to be a formal privatization plan submitted to the Congress by July 1, 1995. So, there is a plan that has to be submitted.

Mr. MYERS. Is there one in the works now?

Mr. HUNTER. Yes, sir, there is.

Mr. MYERS. We expect something by July of this year then?

Mr. HUNTER. That is correct.

Now, the Corporation is still in the preliminary stages with the plan. We haven't at all levels in the Department had an opportunity to look at the details of it, but we have had assurance that once they are satisfied with it in their own minds they will give the Department an opportunity to look at it and provide the comments before it comes to Congress.

Mr. MYERS. Are they operating pretty independent now from DOE?

Mr. HUNTER. I think reasonably so. We talk to them frequently, but I think they are more and more beginning to move, hopefully, towards the private sector and no reliance on the government.

Mr. MYERS. Well, the labs were criticized by a number of reports about overcontrol by the DOE, overregulation. You are not doing that to the U.S. Enrichment Corporation, are you?

Mr. HUNTER. You may be getting a one-sided view. I would like to think we are not, but Nick Timbers can maybe give his version of that. I think we are working in a reasonable fashion right now.

MEDICAL ISOTOPE PRODUCTION

Mr. MYERS. It seems to me like, in the judgment of the Congress when we created it, that it would be the best interest of separating it away from the research side.

One last observation here. You talked about the isotope production for medical, both diagnostic as well as treatment. My understanding is it is still not—we are still importing a lot more than we are producing in this country.

You mentioned one isotope, molybdenum–99 I believe it was, that we are going to be producing. Do you have any more information on that? About the isotope production, medical isotopes I am speaking about.

Mr. HUNTER. Well, let me address the molybdenum–99, which is the one that we are asking for additional funds in the fiscal year 1996 budget. We hope to be in a position where we will garner revenue in fiscal year 1997 and continue to increase our revenue share of the market in 1998.

What we have is a situation here where there is one reactor in Canada that provides the North American supply of this critical isotope. We have, I think, come to the conclusion, first, we would love to see this done in the private sector, but I don't think anyone can afford right now to build a reactor and pay the head-in costs with the uncertainty in the market.

But we also can't afford, I think, to leave our medical system without a potential supply of that isotope. So we are moving into that arena, and we are going to discuss with the private sector, through a Notice of Program interest, whether there is an opportunity for privatization and co-funding for producing isotopes as we proceed. But right now we are concerned that we are going to have a disrupted supply of the molybdenum-99 isotope.

ISOTOPE PRODUCTION

Now, there are other isotopes. We just started the calutrons at Oak Ridge National Laboratory, and we are going to recover all costs associated with those isotopes.

Our competition has been for the last few years the Russians, who have unloaded any isotope that they can to get some currency. People that have purchased their isotopes are beginning to find that the quality isn't necessarily what they had bargained for. And so we are in a position right now where we have a three-year contract for delivery of stable isotopes from a U.S. facility, and that organization could have well purchased that from the Russians, but they decided to buy American.

Mr. MYERS. I don't know which isotope, but Brookhaven also has—aren't they going to be producing some isotope now?

Mr. HUNTER. Yes. We are going to be having isotopes at Hanford, at the Mound Laboratory, at Oak Ridge, at Idaho National Laboratory, at the Sandia Laboratory, at the Los Alamos Laboratory, and at the Brookhaven National Laboratory. Now, some of these are not on a full-cost recovery basis, and they are needed for research purposes. And, in effect, that is what we are asking funds for is to help us, as a government organization, produce those and provide it to the researchers so that we can continue to make advancements in medical technology.

Mr. MYERS. So if we sent you a list of what the NIH and some others say they are needing for isotope, what we need in this country, you could tell us if it is going to be produced, when and——

Mr. HUNTER. Yes, sir.

Mr. MYERS. All right. We will try to provide that.

Mr. Fazio.

GOVERNMENT/PRIVATE SECTOR PARTNERSHIP

Mr. FAZIO. Thank you, Mr. Chairman.

I apologize for not being here at the very beginning. I hope I don't go back over too many times things that you and the Chairman have talked about, Mr. Hunter, but welcome.

We talked in some detail this morning with the renewable side of the House about the question of corporate socialism and all sorts of terms that are being thrown around in terms of using government money to produce some sort of market reaction, and it seems to me that we ought to probably raise the issue again here.

What would you describe as the role the Department has played in the development of nuclear fission through the years and how would you typify the interrelationship with the government and the private sector and the various avenues we have traveled?

Mr. HUNTER. I think when we initially embarked on the nuclear energy program in the Federal Government—and I have been associated with it almost as long as it has been in operation—it was one where the research and development was the intent and purpose of the government through its national laboratories and industry when there was opportunity for the commercialization that has occurred with the light water reactor. I think we had that technology transfer.

Since we went through the downturn in nuclear energy in this country, we haven't had a new order since 1978 in the United States. We have tried to maintain a cooperative relationship with the industrial partners in multiple technologies to try to maintain nuclear fission as an option for the country. That is a position we have maintained through the 1980s, and it is at this time, because of budget constraints and just the continued uncertainty about the potential for nuclear orders, that we are now consolidating down to just light water reactors.

Again, I think absent the cost-sharing—substantial cost-sharing by the industry and the partnership that we developed with industry starting in 1986 on the advanced light water designs, we probably would not be continuing that work, either.

INDUSTRY COST-SHARING

Mr. FAZIO. Well, that is one of the areas I wanted to explore, and that is the amount of cost-sharing we have had. Over the years—maybe you can do this for the record, but to whatever degree you can, quantify what we as taxpayers, the government, what have we invested versus what we have found forthcoming either from EPRI or from utilities directly to help with the development of these future energy sources. It seems to me this is often overlooked, and I wish that you could put on the record to the degree you can that kind of contribution.

Mr. HUNTER. Let me just give you the information that I have regarding the period 1986 to 1996. The contribution from utilities and the industry has been $487.3 million. The government contribution has been $394.4 million, so it is more than a 50–50 cost-shared over that 10-year period, and we expect continued cost-sharing until the end of the program which we expect in 1999.

Mr. FAZIO. How do you project the advanced light water reactor cost-sharing from here on out? I would just like to——

Mr. HUNTER. It will continue to be at least 50–50.

Mr. FAZIO. Maybe 55–45. It sounded like 60–40 almost.

Mr. HUNTER. Yes, sir.

Mr. FAZIO. That will determine, I gather, the degree to which we stay the course. Is that the implication of your earlier comment?

Mr. HUNTER. Well, we certainly don't anticipate any change in our current arrangement with our utilities and our vendors.

Mr. FAZIO. We are going to bring this one off one way or the other? We are not going to truncate?

Mr. HUNTER. I certainly don't see any reason why we would truncate.

UTILITY PARTICIPANTS

Mr. FAZIO. Could you tell us who are some of those major participants in the private side?

Mr. HUNTER. I will turn to another page.

Mr. FAZIO. Go right ahead. Otherwise, why would we have those books?

Mr. HUNTER. I am not finding it as quickly as I would like.

Mr. MYERS. We are not going to leave right away, so go ahead.

Mr. HUNTER. The U.S. participants in terms of utilities—am I answering the question?

Mr. FAZIO. Yes.

Mr. HUNTER [continuing]. Are the American Electric Power, Texas Utilities, TVA, Consolidated Edison, Carolina Power and Light, Duke Power, General Public Utilities, Southern Nuclear Corporation, Union Electric, Wisconsin Electric Power, Vepco Energy, Commonwealth Edison, Florida Power and Light, and Pennsylvania Power and Light, and Public Service Electric and Gas.

In addition, we have General Electric, the Nuclear Energy Institute, Westinghouse Electric Corporation, and the Electric Power Research Institute. And then we also have international participation involving Belgium, France, Germany, Indonesia, Italy, Japan, Korea, Mexico, Netherlands and Spain.

Mr. FAZIO. It seems to imply that there is quite a consensus emerging that we now have centered our activity on the right approach to the next generation of nuclear fission. Is that your opinion? Earnest money is a good indicator.

Mr. HUNTER. It is certainly a test that I think is effective for government employees.

Mr. FAZIO. The other approaches, the IFR, the MHTGR, liquid metal reactor, experimental breeder reactor, these don't seem to elicit the same level of support, is that what you are saying?

Mr. HUNTER. Yes, sir.

Mr. FAZIO. Which have come closest to breaking into the charmed circle? Have any had more interest than any of the others?

Mr. HUNTER. We did have some interest expressed in the liquid metal reactor. And, in fact, we had an expression totaling some $60 million from Japan to continue research and development. But in terms of the total costs that would be involved for the U.S. taxpayers to try to bring that technology to a level that it would be in competition to the light water reactor, it just didn't look economical.

With respect to the gas reactor program, there have been expressions of interest and support by the utilities, but in terms of contributions there simply haven't been any forthcoming.

Mr. FAZIO. Could you for the record, if you can't otherwise—and I assume you would have to—indicate how much we have invested in each of these avenues in the past up to the present?

Mr. HUNTER. Yes, sir.

Mr. FAZIO. And how much private sector participation may or may not have been present?

Mr. HUNTER. Okay. I would be pleased to.

[The information follows:]

COST SUMMARY LIQUID METAL REACTOR/HIGH TEMPERATURE GAS-COOLED REACTOR

From 1948–1986 Government funding for the Liquid Metal Fast Breeder Reactor program was approximately $7.6 billion, and the utility/industry contribution was approximately $150.0 million. The program was changed to the Liquid Metal Reactor (LMR) program in FY 1987. The LMR program was comprised of three key activities—reactor design, the Integral Fast Reactor (IFR)/Actinide Recycle program, and operation of the test facilities. Since the LMR program was established, approximately $80 million of Government funds have been spent on reactor design and approximately $1.163 billion of Government funds have been spent on the IFR/Actinide Recycle program and operation of the test facilities. In addition to the Government funding, approximately $3.0 million of the U.S. utility funding and $37.5 million of Japanese utility funding have been contributed.

The termination of the IFR/Actinide Recycle program and the shutdown of EBR–II and other support facilities at ANL–W will cost an estimated $295.4 million from FY 1995 through completion of shutdown activities in FY 1998.

Prior to completion of the pre-conceptual design phase of the General Electric contract, an estimate was made for program completion through prototype demonstration. The program was estimated to have cost about $3.2 billion (current year dollars) over the period FY 1995 to FY 2010. Since the design contract expires on March 31, 1995, and DOE did not exercise its option to enter the preliminary design phase, to reestablish the program would undoubtably cost more than $3.2 billion.

For the High Temperature Gas-Cooled Reactor program, Government funding since 1966 has been approximately $750 million. In addition, utilities and industry have contributed about $220 million and $740 million, respectively. Termination costs are estimated in $12 million over two years. About $4.0 billion would be required to complete the design, technology, licensing, and construction efforts leading to the deployment of a prototype direct cycle gas-turbine modular helium plant by the year 2010.

TERMINATION ACTIVITIES

Mr. FAZIO. I think that would be important to have.

I am interested in what you mean by termination activities. Obviously, whatever those numbers turn out to be, we have invested a good deal of our time and energy and effort into determining what, if any, is the right path of nuclear fission. I am wondering what is it that we are going to do to guarantee that we don't lose the benefits of that for future generations if ever people want to pick up on these approaches and try to carry them further for whatever reason. Does that fall into the category of a termination activity?

Mr. HUNTER. Yes, and we try to—we use different words depending on what we are doing. There are dramatic words like drop the pencil, and everybody leaves. There is phaseout or closeout, which is trying to document the work and put it on the bookshelf so that it will be available for the future.

For example, we will be closing out the GE contract, which we are allowing to naturally expire at the end of this month. We didn't take any action to bring it to a close sooner so that that information would be documented on the liquid metal reactor design.

We are not doing anything in fiscal year 1995 with regards to the gas reactor program. Our proposal is for fiscal year 1996 to begin the closeout of that program, but we have not recommended at this time to come forward and terminate or stop work on it.

Mr. FAZIO. What do you think will happen in the 1995 fiscal year? I mean, is it funded adequately to complete existing research?

Mr. HUNTER. It is not funded to complete existing research, no. I think there are major research activities that would have to be done, for example, on fuel development for the gas reactor that would have to continue for years to come, so it is going to bring us to a stage. But if one were to go back and look at that technology in the future there is still going to be remaining research and development to be completed.

Mr. FAZIO. I guess one of my concerns—and then I will let you continue answering as it relates to the others—is are we thinking in terms of budgets only, in dollars and cents as it relates to the Federal budget, DOE's budget, or whatever entity may succeed the agency if it is put out of existence? What have you—or are we in any sense able to evaluate each of these independently and try to come to some natural closure? Is there a logical point to stop before we put it on the shelf, if we had the luxury of that?

Mr. HUNTER. We certainly didn't go through a detailed review prior to preparing this budget. We came at it with the constraints that were given to us and looked at the best and most effective program that we could put together for that purpose, so we did not try to figure out the logical break point in either the LMR technology or in the HTGR.

Mr. FAZIO. How about the others, as we terminate them?

Mr. HUNTER. The others—in our termination activity, the major cost there is associated with shutting down the Experimental Breeder Reactor II which is part of the advanced liquid metal reactor program.

Mr. FAZIO. How many years will we be spending money on these termination activities?

Mr. HUNTER. We estimate the shutdown of both the Fast Flux Test Facility at Hanford and of the Experimental Breeder Reactor in Idaho is going to take us about five years to complete. These reactors are more difficult to deal with because of the nature of the sodium coolant and require a different approach than what one has to deal with in deactivating a water cooled reactor.

RUSSIAN ENRICHED URANIUM PURCHASE

Mr. FAZIO. Mr. Myers hit on a number of issues—and again I apologize if we go back over any of them—but I would appreciate it if you could describe our purchase of enriched uranium from the former Soviet Union, from Russia and any of the other independent states, if they are part of the program.

Mr. HUNTER. Well, the purchase that is being made from Russia is being made by the United States Enrichment Corporation, and they have contracted to purchase about 15,000 metric tons of low enriched uranium which will be made from highly enriched uranium and blended down in Russia before it is shipped to the United States.

Beyond that, we are not buying it in the Department itself. We are letting the Corporation do that activity.

Mr. FAZIO. The Corporation is being privatized?

Mr. HUNTER. Well, right now, it is a government corporation that is being privatized. Yes, sir. The value of that Russian purchase is estimated to be about $12 billion. It will act as feed stock for the continued operation of the 109 reactor plants in the United States and foreign sales.

Mr. FAZIO. We would be selling it—reselling it for the international nuclear industry?

Mr. HUNTER. Yes. Japan purchases about $400 million a year from the United States.

Mr. FAZIO. What were the various rationales for this purchase? I am talking now economic, political, military. I mean, what caused us——

Mr. HUNTER. I think you may have just covered all three.

Mr. FAZIO. I am wondering if you could put a little meat on the bone.

Mr. HUNTER. Certainly economics. It looked attractive at a time we were trying to privatize an entity to give it inventory so that it could market and make some recovery of costs and, hopefully, profit to continue the enterprise.

I think also from a standpoint of military or national security, removing that material from Russia at this time seems like something in our interest, and a combination of price and confidence that they are, in fact, dismantling their warheads. That was certainly an important factor.

Mr. FAZIO. Is there any question about that at the moment? I know there is a lot of concern about international terrorism and trafficking in materials internationally, some people even alleging that the organized crime elements in the former Soviet Union are involved. But how effective are we in really tracking materials that may be moving around in the region? It is nowhere near as tight as it is in this country. That is my understanding.

Mr. HUNTER. I probably am not the right person to speak to that. That would be under our Nonproliferation and Arms Control group. But I agree with your comment. We certainly know more about what is going on in this country and our allies than we do in the former Soviet Union.

Mr. FAZIO. How much more of this kind of material do we think is available?

Mr. HUNTER. I am not aware that we have any—well, available?

Mr. FAZIO. For sale perhaps.

Mr. HUNTER. I am not aware that there is any more in the pipeline.

Mr. FAZIO. Would this be of interest to us if it were to be true? Would the Corporation, I guess, be of interest?

Mr. HUNTER. The time that we are taking delivery of this material and the market over the period in which we sell it out, it is going on for a period of 20 years, so I don't know at this time whether we would want to invest additional funds in making this.

Mr. FAZIO. This is a 20-year contract we have?

Mr. HUNTER. Yes, sir.

Mr. FAZIO. Why was it decided to take—I mean, I don't understand the structure of it.

Mr. HUNTER. It takes time to get the material out of the weapons. Then you have to blend it down to be low enriched uranium, which means that it is under 20 percent, 19 percent approximately. Well, actually, in this case we will be down closer to between 4 and 5 percent enriched uranium so that it can feed right into full production facilities for U.S. and foreign operating reactors.

Mr. FAZIO. Was there a reason for not making it happen sooner, the optimum level that they can extract from weapons? I mean, it seems to me that some people would have wanted to move much more rapidly on something that would obviously be of some military and strategic importance to us. Is it impossible to do?

Mr. HUNTER. I don't have a good answer as to what the long pole in the tent is. I would, if I could, like to answer that for the record. I would have to talk to some of my colleagues.

Mr. FAZIO. Assuming it is appropriate to answer it for the record, I would be interested in getting that information.

Mr. HUNTER. Okay.

[The information follows:]

PURCHASE OF RUSSIAN ENRICHED URANIUM

Russia currently has a physical capability to convert and blend only 10 tons of HEU per year. Achieving the 20 year schedule of the purchase contract requires a threefold increase in years 6 through 20 with the financing for the increased capacity being obtained from prior year sales. There is no provision in the Russian HEU purchase contract that would preclude accelerating the scheduled deliveries, if increased capacity were available sooner.

Mr. FAZIO. Mr. Chairman, since we have another Member of the committee, I think I have had my share. Thank you, Mr. Chairman.

Mr. MYERS. Mr. Knollenberg.

Mr. KNOLLENBERG. Mr. Chairman, just briefly. I appreciate the opportunity, but I am going to pass momentarily and defer back to you for some questions you might have. I am processing a couple right now.

Mr. MYERS. I had my five minutes.

Mr. KNOLLENBERG. Well, you may have another five. I do have a couple questions, but I want to formulate a couple things first. I will bow to you for a moment or two, and you can take over for a moment.

RUSSIAN POWER GENERATION

Mr. MYERS. Well, thank you.

Mr. Hunter, following up somewhat, we had an earlier discussion, then again with Mr. Fazio. I am concerned about what we are doing in the former Soviet Union, Ukraine, elsewhere and also Russia, particularly where we have the three stations that have, I guess, weapons grade potential. We are buying them out? I am putting it in language I understand. What we are going to do is to decommission those three reactors; is that right?

Mr. HUNTER. On the production reactors the agreement we have is that those reactors would be shut down by the year 2000.

However, this puts a requirement in this system right now to figure out what to do with regards to replacement power. There isn't a whole lot of interest over there to shut down any nuclear reactor. They look at the power as being something that is needed to maintain the economy. And we are working on looking at alternatives to try to see if replacement power can't be worked out and financing—not DOE financing—but financing on the marketplace somehow, through World Bank or some other means, to assist them in trying to get replacement power. Otherwise, those reactors may continue to operate.

Mr. MYERS. Well, you call them production reactors, but they do generate electricity from those reactors, too, don't they?

Mr. HUNTER. That is correct.

Mr. MYERS. That is what you are concerned about replacing—I think maybe it is classified, but there is an agreement that we are going to take care of—maybe I won't ask that question.

But I think it is a concern to us that, yes, the safety of those reactors and the potential here that they can produce weapons grade material. But we are narrowing our perspective here, our future alternatives just down to one reactor, one type of reactor, and we are helping bail them out to a tune of over $100 million this year alone.

And it does concern some of us. Do we have the proper priorities? And in decommissioning, which I guess we will be decommissioning these three reactors, are we going to find ourselves in a similar position to what we find in Korea now, North Korea, where we have to do not only that, we have to clean up their waste also? What does the future look like on this?

Mr. HUNTER. Again, I think this is an area which I haven't spent all that much time on. I need to talk to other people, State Department and others, as to what our liabilities are.

I don't believe we have any liability relative to a cleanup situation. I think our main goal is to get those reactors shut down. They are currently producing plutonium, and we see no interest in this country for continued production of plutonium in Russia, and so we would like to get those reactors down.

Now, at this time, at least in every visit that anybody makes to Russia, and I have had one opportunity to be there, they are certainly eager to obtain any funds for any purpose, and so I am sure they will try to seek some additional assistance to help in any arena that they think they can get our assistance.

SOVIET-DESIGNED REACTOR SAFETY INITIATIVE

But our main program really is directed at the 66 operating Soviet-designed reactors. That is where our focus is, to see if we can work with them.

And most of the money that we are spending in the international program is being spent in the United States. It is not being spent in Russia. It is to build hardware. It is to provide for people from the United States to go and help train not the managers that are sitting in Moscow but to get at the deck plate where the people that are operating the plant—and try to train those people better so that they understand how they should conduct operations.

That is one of the eye openers we have had as we have gotten into Russia and other areas of the eastern bloc. They operate plants quite a bit differently than we operate our commercial reactors, and we don't think that is in the interest of the United States to have a potential situation where we would have failure of one of their reactor plants due to training or to poor equipment or to inability to do safety analysis and those kinds of things.

Mr. MYERS. Everything we have heard—they are careless if not reckless in their operation. Of course, Chernobyl is a good example where maybe it was improperly designed with a graphite moderator, but, nevertheless, we have had—of course, at Hanford——

Mr. HUNTER. The people that have met eyeball to eyeball with the plant operators find in them the same dedication and commitment to try to do the job right. We are just not sure they have got the tools. We don't sense that there is any interest in making mistakes.

But in terms of proceduralized approach, you find in some plants they don't even have procedures. They are locked up because they don't have money to Xerox them and give them to the operators. So people are working on rote, which is not a good way to do things in complex reactor plants. We haven't done that in this country at all.

And so there is a lot to be transferred between the United States and Russia and eastern bloc countries in terms of improving conduct of operations, but also giving them the tools so that they can take care of themselves later. We don't have enough money in this country to fix their problem.

Mr. MYERS. I am glad you said that.

Mr. HUNTER. We really don't.

Mr. MYERS. Well, I think we are all concerned about that because nuclear is not only a national problem for them. It is a world problem.

Mr. HUNTER. Yes, sir.

INTERNATIONAL ASSISTANCE FOR RUSSIA

Mr. MYERS. What about the rest of the European Community? Are they helping in any way? Why is it solely our responsibility? They have a greater interest than we have, really.

Mr. HUNTER. There are 20 other countries that are contributing to this activity, and about three-quarters of a billion dollars has been pledged to this activity through 1994.

Mr. MYERS. Would you provide for the record what that is? Because I am sure when we go to the Floor and they see this item here it is going to draw a lot of attention. So if you could provide what other countries and how much of the total responsibility they have, it would help us a lot.

Mr. HUNTER. I would be pleased to.

[The information follows:]

INTERNATIONAL ACTIVITIES

The following countries have directly sponsored projects to improve the safety of Soviet-designed nuclear power plants. This list is taken from table three of a document titled "G-24 Nuclear Safety Databank Summary Data," which is being provided to the Subcommittee staff.

Country	Funding[1]
Belgium	6.63
Denmark	2.14
France	44.71
Germany	127.51
Italy	26.81
Netherlands	2.66
Spain	1.63
United Kingdom	15.35
Austria	0.06
Finland	8.00
Norway	8.47
Sweden	19.45
Switzerland	10.06
Canada	22.37
Japan	67.80
United States	109.03

In addition, several countries have provided additional funding for safety efforts through international organizations such as the International Atomic Energy Agency and the organization for Economic Cooperation and Development.

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[1] Millions of European Currency Units (As of 3/21/95: 1 ECU = $1.3192 U.S.)

PURCHASE OF RUSSIAN ENRICHED URANIUM

Mr. MYERS. I wasn't quite sure of your response to Mr. Fazio on the purchase of uranium. I never quite understand why we are buying uranium from Russia.

Mr. HUNTER. Again, I think there are two factors. One is, if we are going to have highly enriched uranium which we would prefer that Russia didn't have, the price is such that by blending it down to low enriched——

Mr. MYERS. Oh, that is what—I thought there was another purchase besides that. I understand that the weapons——

Mr. HUNTER. No, what we are purchasing from Russia is low enriched uranium.

Mr. MYERS. Pakistan, we are going to do something with that, aren't we?

Mr. HUNTER. We are going to sell it. The United States Enrichment Corporation is going to sell that material for the domestic market as well as the foreign market. We have a very good price on the materials, so it strengthens the privatization activity for the Enrichment Corporation.

It does two things: One, it takes that material out of the hands of the Russians and gets it in the hands of the United States; and, two, it could be used in our nuclear reactors.

Mr. MYERS. That is the purchase we are talking about then?

Mr. HUNTER. Yes, sir.

U.S. ENRICHMENT CORPORATION PRIVATIZATION

Mr. MYERS. I didn't quite understand that.

You mentioned the U.S. Enrichment Corporation. Now, again, going back to that, it seems like there was an intent when Congress thought about this being privatized that somebody would buy that facility and operate it. Right now, it is being operated, but no one owns it except DOE, but it is kind of a lease situation. Is it still intended that somebody will actually own it and operate that independent from the Federal government?

Mr. HUNTER. The privatization plan that is coming in July of this year is going to outline the approach by USEC to effectively go out on the market and let someone purchase it as a private corporation. Now, the assets are still being worked on as to what the value of the company is, and they are going through their financial people and working that side of the equation, but then it is going to be offered to see if anybody will purchase it as a private entity.

IRRADIATION EXPERIMENTS

Mr. MYERS. What about the test at the Advanced Test Reactor? I think it has been kicked around.

First, it was going to be done—as I recall, it was going to be done at the Fast Flux Test Facility at Hanford. Then we moved it over to Idaho and the EBR–II. Who is going to do it now, if ever? Why don't we wait until the dust settles and decide where we are going to spend that money?

Mr. HUNTER. When a decision was made to shut down the Fast Flux Test Facility internally—and this was during the era of Secretary Watkins.

Mr. MYERS. Clear back in his time?

Mr. HUNTER. Yes, sir.

Mr. MYERS. I almost lost track of how long ago it was.

Mr. HUNTER [continuing]. The agreement was made between the Office of Nuclear Energy and the Office of Energy Research that we would try to design and put into another reactor a test article so that they could conduct fusion and irradiation experiments.

You are correct in saying I had the opportunity to initiate the activity at the Argonne National Laboratory so that we could start design of a test vehicle there. And then, subsequently, we decided to shut that reactor down, and we are now trying to make that vehicle to go into the Advanced Test Reactor. It is really an opportunity for these people to get irradiation data and fusion materials.

That is the program that they had in FFTF. They had expended funds along with foreign entities. The Japanese were also involved in that experiment out in the FFTF. So this was just trying to get them back to where they were at before we made the decisions to shut down, first, the Fast Flux Test Facility and, second, the Experimental Breeder Reactor II.

EXPERIMENTAL REACTOR TERMINATION COSTS

Mr. MYERS. Of course, years ago when I was in the Army I remember talking about irradiated food, and the Department of Agriculture has got some programs going there, too, in irradiation. The IFR is being terminated I guess because of budgetary reasons. How much do we presently have invested in IFR research? Can you tell us?

Mr. HUNTER. I would like to get you the number. I think I know the number, but I would just like to get it for the record.

[The information follows:]

COST SUMMARY

LIQUID METAL REACTOR HIGH TEMPERATURE GAS-COOLED REACTOR

From 1948–1986 Government funding for the Liquid Metal Fast Breeder Reactor program was approximately $7.6 billion, and the utility/industry contribution was approximately $150.0 million. The program was changed to the Liquid Metal Reactor (LMR) program in FY 1987. The LMR program was comprised of three key activities—reactor design, the Integral Fast Reactor (IFR)/Actinide Recycle program, and operation of the test facilities. Since the LMR program was established, approximately $80 million of Government funds have been spent on reactor design and approximately $1.163 billion of Government funds have been spent on the IFR/Actinide Recycle program and operation of the test facilities. In addition to the Government funding, approximately $3.0 million of U.S. utility funding and $37.5 million of Japanese utility funding have been contributed.

The termination of the IFR/Actinide Recycle program and the shutdown of EBR–II and other support facilities at ANL–W will cost an estimated $295.4 million from FY 1995 through completion of shutdown activities in FY 1998.

Prior to completion of the pre-conceptual design phase of the General Electric contract, an estimate was made for program completion through prototype demonstration. The program was estimated to have cost about $3.2 billion (current year dollars) over the period FY 1995 to FY 2010. Since the design contract expires on March 31, 1995, and DOE did not exercise its option to enter the preliminary design phase, to reestablish the program would undoubtably cost more than $3.2 billion.

For the High Temperature Gas-Cooled Reactor program, Government funding since 1966 has been approximately $750 million. In addition, utilities and industry have contributed about $220 million and $740 million, respectively. Termination costs are estimated at $12 million over two years. About $4.0 billion would be required to complete the design, technology, licensing, and construction efforts leading to the deployment of a prototype direct cycle gas-turbine modular helium plant by the year 2010.

EXPERIMENTAL REACTOR TERMINATION COSTS

Mr. MYERS. It is going to be terminated now.

Mr. HUNTER. We are about 20 percent defueled at the present time in the Experimental Breeder Reactor II.

Mr. MYERS. How much more is it going to cost us to defuel it and decommission it?

Mr. HUNTER. We are looking at the neighborhood of about $400 million over the 1995 through the 1998 timeframe to complete the defueling, drain the system of sodium, treat the fuel for interim storage and react the sodium for disposal. That will take us approximately four years to do, and we started October of 1994.

Mr. MYERS. How about the HTGR, the helium reactor now, how much do we have invested in that research?

Mr. HUNTER. I think I know that number, too, but I would like to——

Mr. MYERS. The same condition? And what is it going to cost to terminate?

Mr. HUNTER. Termination is quite easy on the gas reactor activities because we simply don't have all the facilities that we had associated with the Integral Fast Reactor.

Mr. MYERS. That is going to be somebody else's responsibility. How about them coming back and claiming that we have to help them? That is going to be the private sector, isn't it, some of that?

Mr. HUNTER. Yes, that is not government responsibility. We have some facilities at General Atomics in La Jolla that we had fabricated fueling, government-sponsored program, and we have a responsibility to close that activity out, but it is fairly small in comparison to anything we are dealing with as on the sodium reactors. These are not reactors; these are hot cells.

Mr. MYERS. What about the advanced liquid metal reactor? We are terminating that program, too. It seems like we are talking about termination here. Maybe somebody could talk about terminating the Department of Energy. Is that all part of the—are you preparing for that? Terminating all your research?

Mr. HUNTER. No, sir.

Mr. MYERS. There is a bill introduced across the street to terminate DOE. Maybe there will be nothing left to terminate if you keep going out of business.

Mr. HUNTER. We are trying to, again, in the nuclear energy program, adjust to the realities of the situation. I think when people talk terminating the Department of Energy, I am not quite sure what that really means. Much of the activity going on in the Department gets done anyway, whether it is done in the Department of Energy or some other place. The weapons are the weapons, and they are not going to change. They are there.

Mr. MYERS. What about the Liquid Metal Reactor? What is it going to cost to terminate? Would you also provide us how much we have invested now and how much it is going to cost to terminate?

Mr. HUNTER. I think because of the way we structure our budget, the Liquid Metal Reactor was a design activity at General Electric.

We have no termination costs for that. As I mentioned, the contract is going to expire at the end of this month, so we have no termination costs for that aspect. But in order to take that design that GE was talking about and do the research and development leading to some future reactor, required the integral fast reactor technology, which Argonne National Laboratory was working on; that is where we have the big expense in termination. It is not at the General Electric with the design contract.

Mr. MYERS. How about EBR–II?

Mr. HUNTER. That is a very expensive undertaking. We are looking at probably $400 million to shut that reactor down.

Now it is not only putting it in what I call an industrially and radiologically safe condition, but it is also taking care of the sodium so that it can be disposed of. We are treating the fuel in order that we can hold it in some interim storage until the repository is available.

We have the unique situation with this type of fuel that there is sodium inside the fuel pins, and that was added to improve heat transfer. We now need to remove that sodium because it is a mixed hazardous waste, so we are taking the sodium out of the fuels pins. We are utilizing the technology we actually developed as part of the IFR program to do that, and the facilities that we built for the Integral Fast Reactor are also being utilized for that purpose.

PROGRAM TERMINATION

Mr. MYERS. I think I mentioned four. Are there some other programs you are terminating that I have lost track of?

Mr. HUNTER. Nothing of any size. We have the Tower Shielding Reactor down at Oak Ridge which we shut down in 1992, I believe.

Mr. MYERS. That has already been terminated, hasn't it?

Mr. HUNTER. Yes, sir.

Mr. MYERS. Of course, the SSC had been pretty well terminated, too, I guess.

Mr. HUNTER. We have in the budget the surveillance and maintenance on certain facilities that have been terminated in the past. That is in our termination budget request. At certain points you just bring the facility down to what I call a safe storage condition, and then there is a legacy to continue on.

We are moving those facilities over to the Environmental Restoration and Waste Management program at some point for ultimate D and D, and we are in transition on some of those facilities, but most of them are quite small.

Mr. MYERS. Well, we have started a lot of them and never finished.

Mr. HUNTER. My colleague just mentioned one more termination I had forgot about and that is the Space SP–100.

Mr. MYERS. SP–100. You are still in space, though you have a different program going. What is it called? The SP–100 was terminated a couple years ago, though, wasn't it?

Mr. HUNTER. But we are still—I think we are incurring costs in the closing of the SP–100.

Mr. MYERS. Which I thought was a mistake. But the enrichment program—you know, we had the centrifuge. We started two plants in Ohio. We spent several billion dollars, then decided we didn't need them. Then we had the fast breeder reactor.

Mr. HUNTER. Clinch River.

Mr. MYERS. We had it pretty well completed and decided we were going to—we have gone down so many paths. Linear fusion we backed off. I don't know how many times we have spent a lot of money and backed off. We are kind of gun-shy to anything new anymore.

Mr. Knollenberg.

Mr. KNOLLENBERG. Thank you, Mr. Chairman. I appreciate having a chance to come in late. And not having the advantage of having heard some of the questions that were raised, I may be treading on ground that you have been over, but let me just start.

I want to get back to this Russia thing to the extent that you can talk authoritatively or maybe not go beyond what might be classified or what have you. I know—don't take this literally, but so many people that appear before us indicate that their particular—

I just want to mention, too, that I note from your bio that you are a graduate of Wayne State. I happen to be from Michigan, just to the north of the City of Detroit. I noticed also you were a professor or certainly you were an instructor——

Mr. HUNTER. An instructor, yes, sir.

ISOTOPE PROGRAM

Mr. KNOLLENBERG [continuing]. At Wayne State, so I just want to comment on that.

Many people that come before us suggest that their particular agency is run like a business, and I know that they don't really totally mean that. They can't. Because, for example, if I just ask you the question why is a subsidy necessary, that suggests—well, it brings a question. A subsidy is necessary because somewhere along the line something is happening that requires a subsidy. And it may or may not be inefficiency. It may not be overlap or any of the other problems. But if you had to sell isotopes at the full production cost, it would be another matter, I am sure, so you do have to have some Federal help.

Mr. HUNTER. Well, this again deals with certain types of isotopes. We tried this under the revolving fund where we were mandated by law to make it full cost recovery, and we didn't make isotopes because no one could afford to buy them. University researchers couldn't afford to pay for them. Medical schools that were seeking the isotopes couldn't afford to pay for them.

Those isotopes that can be purchased at full cost recovery, like cobalt 60, iridium 192, those we can make, and we can recover full cost. But we are in a position where we have the facilities already invested by the taxpayers so that we can produce those and recover all the cost.

If one had to look at producing cobalt 60 and had to build a reactor, I don't think they would enter that business. There is no commercial suppliers of any of these isotopes in the United States. We used to have them back 10, 15 years ago.

EMPLOYMENT OF FULL-TIME EQUIVALENTS

Mr. KNOLLENBERG. Turning the corner to another question. I tried to pull out of some of the information provided here what your FTE, your personnel growth has been, let's say in the last five years. Could you shed a little light on that?

Mr. HUNTER. In fiscal year 1993, the FTEs that we had on this program were 258. The budget request we have for fiscal year 1996 will support 154 FTEs. So we have had about a 40 percent reduction.

RUSSIAN NUCLEAR PROGRAMS

Mr. KNOLLENBERG. In terms of the international activities, I want to turn to Russia because—you have had some discussion about Russia and the concern—you mentioned here that there are 66 operating civilian——

Mr. HUNTER. Soviet-designed reactors.

Mr. KNOLLENBERG [continuing]. Soviet-designed reactors.

Mr. HUNTER. Correct.

Mr. KNOLLENBERG. There are the three that produce the weapons grade plutonium.

Mr. HUNTER. Yes.

Mr. KNOLLENBERG. What are they doing with that? The weapons grade plutonium?

Mr. HUNTER. They are just storing it. We have an agreement that they won't use it for weapons, but they are continuing to store plutonium.

Mr. KNOLLENBERG. You are familiar, I know, but are you in a position to respond to a question about the sale by Russia to Iran of the nuclear reactor?

Mr. HUNTER. I just have no firsthand knowledge on that. I think, again, we could get the proper people, but I have no firsthand knowledge of it.

Mr. KNOLLENBERG. This may be another panel. It is not a question that you know. It is not one—you don't deal with it?

Mr. HUNTER. No, we have no responsibility for that at all.

FUNDING FOR SOVIET SAFETY PROGRAM

Mr. KNOLLENBERG. I understand. You mentioned that the DOE support to the Soviet-designed reactor safety program has increased in 1996 to $78 million. What was it last year?

Mr. HUNTER. Well, actually it is a decrease if you look at our planned expenditures.

Mr. KNOLLENBERG. Explain that to me. How is an increase a decrease?

Mr. HUNTER. The funding in fiscal year 1995 and prior years has come from the Agency for International Development. If we look at the funds that we have been receiving from that organization to us for management of the safety program, it is higher in fiscal year 1995 than our budget request in fiscal year 1996.

Mr. KNOLLENBERG. What percentage do you get from other agencies?

Mr. HUNTER. Well, we got 100 percent up until fiscal year 1996. And we just sort of lost patience with the bureaucracy in trying to get money moved around in the Federal government. We have had to delay work because of the inability to effectively get money moved—and this is not to be accusatory against any agency, I think it is just the way the government works. We have no Nunn-Lugar money.

Mr. MYERS. Would you yield?

Mr. KNOLLENBERG. I will yield to the Chairman, yes.

Mr. MYERS. Why not Nunn-Lugar? These are taking defense weapons out of the system or material.

Mr. HUNTER. Our interpretation of Nunn-Lugar is it is for the dismantlement of the Russian weapons complex. We are not dismantling that. That is something that will be done by other folks.

Mr. MYERS. I hate to argue with you, but it has been producing weapons-grade plutonium. If that isn't reducing their military weapons system, I don't know what would be.

Mr. HUNTER. We are looking at the feasibility right now of what can be done. If anything is actually going to get done, then I think it would qualify for Nunn-Lugar, but at this point we need to look at the feasibility and potential solutions first.

Mr. MYERS. Thank you.

RUSSIAN-IRANIAN AGREEMENT

Mr. KNOLLENBERG. You are welcome, Mr. Chairman. I think we are coming to the end of my questions, too.

I had hoped to ask something regarding the Russian situation because I am concerned. And I sit on another committee or two that probably more speaks to the point of that and the concern that all of us have about this exchange or this agreement between Russia and Iran.

Because whatever you are doing in Russia and whatever you are able to scrutinize and keep under observation, I think you probably have to admit that some of it gets away from you, doesn't it? It is beyond your having any power to stop that movement of nuclear material from Russia to Iran, wouldn't you agree to that?

Mr. HUNTER. Well, we in the Office of Nuclear Energy don't have any power in that regard at all, but that would fall under the purview of the intelligence community.

Mr. KNOLLENBERG. I think my questions, then, probably should better be served up to someone in another category or agency, but I do appreciate your response and your time.

That will conclude my questions. So thank you, Mr. Hunter.

Mr. HUNTER. Thank you.

PROGRAM TERMINATIONS

Mr. MYERS. Thank you, Joe.

On these terminations, please provide for the committee what we have already invested in each of these programs, what it is going to cost to terminate, and what it would cost—as best as you can project, what it would cost to complete—just IFR, as an example. What would it cost to bring IFR on line as well as the turbine reactors? And so, if you would, please.

Mr. HUNTER. Yes, sir.

[The information follows:]

COST SUMMARY

LIQUID METAL REACTOR/HIGH TEMPERATURE GAS-COOLED REACTOR

From 1948–1986 Government funding for the Liquid Metal Fast Breeder Reactor program was approximately $7.6 billion, and the utility/industry contribution was approximately $150.0 million. The program was changed to the Liquid Metal Reactor (LMR) program in FY 1987. The LMR program was comprised of three key activities—reactor design, the Integral Fast Reactor (IFR)/Actinide Recycle program, and operation of the test facilities. Since the LMR program was established, approximately $80 million of Government funds have been spent on reactor design and approximately $1.163 billion of Government funds have been spent on the IFR/Actinide Recycle program and operation of the test facilities. In addition to the Government funding, approximately $3.0 million of U.S. utility funding and $37.5 million of Japanese utility funding have been contributed.

The termination of the IFR/Actinide Recycle program and the shutdown of EBR–II and other support facilities at ANL–W will cost an estimated $295.4 million from FY 1995 through completion of shutdown activities in FY 1998.

Prior to completion of the pre-conceptual design phase of the General Electric contract, an estimate was made for program completion through prototype demonstration. The program was estimated to have cost about $3.2 billion (current year dollars) over the period FY 1995 to FY 2010. Since the design contract expires on March 31, 1995, and DOE did not exercise its option to enter the preliminary design phase, to reestablish the program would undoubtedly cost more than $3.2 billion.

For the High Temperature Gas-Cooled Reactor program, Government funding since 1966 has been approximately $750 million. In addition, utilities and industry have contributed about $220 million and $740 million, respectively. Termination costs are estimated at $12 million over two years. About $4.0 billion would be required to complete the design, technology, licensing, and construction efforts leading to the deployment of a prototype direct cycle gas-turbine modular helium plant by the year 2010.

INTERNATIONAL NUCLEAR RESEARCH

Mr. MYERS. What are other countries doing about research in alternate sources of energy or different types of reactors? Russia had a fusion program going, I know, but were they doing anything in reactor research? Is France, Japan or anybody else doing anything?

Mr. HUNTER. I think certainly the Japanese are continuing to look at reactor research. But when we look at our European partners—France, Germany, England—they have been backing away from these other more advanced reactors.

In the Japanese program, the breeder reactor, which is still in their long-term plan, continues to be deferred out longer and longer. They are proceeding with more and more construction of light water reactors, but they are also proceeding with reprocessing capability to extract the plutonium in light water fuel in preparation for ultimate deployment, at least in their minds, of a breeder reactor. Again, I think because of the lack of any indigenous coal or oil in Japan.

Mr. MYERS. If I recall correctly, France, Russia and the Netherlands were in the turbine—gas turbine reactor business a few years ago. Are they out entirely now?

Mr. HUNTER. I am not aware that there is any significant work going on.

Mr. MYERS. Maybe I am mistaken, but I believe we had testimony a few years ago where they were also——

Mr. HUNTER. Well, there has been international interest in the gas reactor. In fact, we have an agreement right now with the Japanese that will expire this September for cooperation on the gas reactor program. We are going to allow that agreement to expire simply because we don't have a program to exchange information on anymore, but it is very low level.

There was also an agreement with Germany for fuel irradiations in a low level program.

But there has been interest, international interest in cooperation between our engineers in our country and foreign countries on the gas reactor.

FUTURE OF NUCLEAR ENERGY

Mr. MYERS. Well, I am worried about—and here again I certainly don't want to throw money—I am one of the last persons in the world that wants to see money thrown around, but I am deeply concerned about the future of our energy needs for this country.

When we look at historically what has happened in the past—as an example, I think in your testimony you spoke about we are producing 100 gigawatts right now of power—nuclear. After the turn of the century, they are going to start—plants will not be relicensed—will not be capable of being relicensed. We are down to 66 gigawatts. That is a one-third reduction.

And, notwithstanding our growth, and the demand is going to, obviously, go up, I hope if we are going to continue to expand, what are our children and grandchildren going to do? They can't build a coal-fired one now. The environmentalists won't let us build a coal-fired plant. You can't build a dam to generate electricity from hydro. We had solar in this morning, and the cost of solar is pretty high today.

We are going to—this committee has been spending a lot of money, your tax dollars, to explore new sources of energy, including solar and other renewables, but we just don't have the capacity in renewables to do it, I don't think, for the future. We are just going down one path, the proven path.

I quite agree if I only had a dollar to build a reactor I would build one I knew how to build, but I would also think the reason we create a Department of Energy is to prepare for the future, and it seems like the Department is failing us for the future of our children and grandchildren. Are you the least bit worried about what it is going to look 25, 30 years from now?

Mr. HUNTER. Well, again, I think the investment we are making right now in partnership with our industry in both utilities and vendors provides the United States with an option to purchase advanced light water reactors which will last us 30 to 40 years into the future. We, again, are in a situation where it is hard to tell what the next—when the next order will be in the United States.

As one who has spent 30 years in nuclear——

Mr. MYERS. Do you suppose you and I will still be alive when that happens?

Mr. HUNTER. Sir, I certainly hope so.

Mr. MYERS. You must be going to live a little longer than I am. Of course, you are younger than I am. Everybody here is. Even you, Joe.

Mr. KNOLLENBERG. I qualify.

Mr. MYERS. Pardon me. Go ahead.

Mr. HUNTER. In trying——

Mr. MYERS. Just being practical.

Mr. HUNTER. In trying to look at the budget constraints we are faced with, in trying to look at the future, we wanted to have ready and available standardized designs for purchase by our utilities in the United States, and that is what we are striving to do. Even if we worked and invested large sums of money, we would not have another reactor option available by the turn of the century. It just won't be available.

Mr. MYERS. That is only four years from now.

Mr. HUNTER. Yes, sir.

Mr. MYERS. We won't be needing one by four years from now anyway.

Mr. HUNTER. I think you are——

Mr. MYERS. Projections are right beyond—with NRC the way it is, it would take them that long to get one licensed.

Mr. HUNTER. Well, that is part of the process we are in with the NRC in these plants is going through the design certification, which we think will expedite licensing and design and construction, the final design and construction of these reactors in the future.

ISOTOPE PRODUCTION

Mr. MYERS. I hate to think we would have to go to Japan for our reactors or France or someplace else, but it looks like we are going to have to.

I talked about the radioisotopes a while ago. Other than medical and research, we have to go out of the United States now for most of them. Why can they produce in Russia or Canada or some in France—why can they still produce the isotope and we can't?

Mr. HUNTER. Well, I think the Russians, again, were unloading inventory and penetrated the market.

Mr. MYERS. Lord knows, we have an inventory we have to unload, too, haven't we?

Mr. HUNTER. We are selling off inventory. That is what we did in 1993 and 1994 was selling off inventory where we had produced these isotopes in the calutrons. Now we are starting them back up again because we can recover full cost.

Mr. MYERS. Don't we have reactors sitting out there capable?

Mr. HUNTER. We can produce every isotope on the chart of nuclides. We can do it all. It is just a question of there has to be a market. There is not a market for all these isotopes. There is interest, but in terms of people paying cost to get these isotopes——

Mr. MYERS. Is that the reason? Well, why can they produce them and we can't?

Mr. HUNTER. Well, some of the isotopes that we are talking about we can produce here. We can make those.

Mr. MYERS. Well, in the medical diagnostic field——

Mr. HUNTER. I mean, the molybdenum–99, for example, was something that was produced in the United States in Tuxedo, New York. Cintichem was in the business and decided to go out. Otherwise, they were in competition with the Canadians.

Mr. MYERS. Why could Canadians produce it and we couldn't?

Mr. HUNTER. I think in the current situation they have a multipurpose reactor that is being used, and it is being done in a marginal sense, which is the way we make our isotopes in this country.

For example, the cobalt 60 we make in the Advanced Test Reactor is produced in a reactor dedicated to do materials, fuels and materials research for naval reactors. If it had to be committed to make cobalt, there wouldn't be any cobalt produced in that reactor at all. The costs would be so extraordinary.

I think the same thing is going on in the foreign reactors. I mean, the reactors are for other purposes, and they are working in the margins.

ISOTOPE PRODUCTION CAPABILITIES

Mr. MYERS. How many reactors do we have today that we are in the process of decommissioning in various stages?

Mr. HUNTER. The Department of Energy in 1980 had, I believe, 80 reactors including critical facilities. I think we are now down to five.

Mr. MYERS. We couldn't have converted any of them over for production of some of the isotopes and not have to look for a foreign source?

Mr. HUNTER. Well, we are converting one of the defense reactors right now to make the molybdenum–99. That is what we are doing.

Mr. MYERS. You keep coming back to one. Of all the isotopes we need for diagnostic works as well as research, there are many of the isotopes—I don't have a list of them here—but the medical profession tells me there are many of them that they have trouble getting because they come from a foreign source.

And part of the problem is they have a half life. And by the time they get here—iridium is one of them you mentioned a moment ago. It has a very definite half life. By the time it gets here—I guess we are producing it now, is that right? Back in the United States again? Iridium 99—not 99?

Mr. HUNTER. 192.

Mr. MYERS. But, anyway, the quality has gone down. But a lot of it is because they have a half life and by the time they move it over here not only the cost of transportation but the efficiency of the metal, of the isotope is depleted considerably.

Well, I am just concerned that we are looking outside the United States, that we are not going the direction that I think we should be going. And I guess the only people I have to blame is you folks who are going down one path now. We are not going to explore over here. We are going to depend on the future, depending upon something.

NUCLEAR REACTOR DEVELOPMENT CHOICES

I don't think the utility industry has to look for you. They know what the light water reactor is. They just have a problem getting anybody to license it. I wonder why they need the Department of Energy today. We have had light water reactors for a long time. Before they even went into the DOE they had light water reactors. We have the advanced water reactor. But——

Mr. HUNTER. I think, again, as a result of the experience in the United States and going through the initial deployment of the light water reactor, we did recognize there were some things that—and licensing certainly was one of them, problem areas. The utilities, as the ultimate customer, feel by contributing at this point in time to get a standardized design, the licensing process and hopefully, cost and schedule information so that business decisions can be made. They feel at least it will be a potential option for the future.

Absent this advanced light water reactor program, I don't think there will be a new order in the United States at all, in my opinion.

I should add, also, I tend to be very biased. I think U.S. technology still is superior to any technology in the world, and I think that is why we will remain to be competitive in foreign markets when it comes to nuclear technology.

That is why the South Koreans are building a U.S. design. That is why Japan builds U.S. designs. And we would like to have that influence for the future. It means jobs here at home. It also keeps the option open in the event our utilities wish to use that as one of the energy sources.

FUTURE POWER REPLACEMENT

Mr. MYERS. Again, I mentioned awhile ago and I don't think I got an answer, how are we going to replace the 33 gigawatts? It is going to be more than 33, replace the existing 33 gigawatts of power, and we are going to have demand for greater. How are we going to produce it in the year 2020? Do you have any suggestions for our children and grandchildren?

Mr. HUNTER. First, one of the things that we are trying to do is work again in a cost-shared program to extend the lives of these reactors that are out there now, the 109 reactor plants. It isn't a priority that these reactors have to come off line.

I think it is going to be a business decision by the utilities as to whether or not the cost for continued operation and the additional requirements that might be imposed by the Nuclear Regulatory Commission make it such that it doesn't look attractive to continue operation. But we in the Department are working with the utilities and the vendors to look at the aging effects on these reactors, including, for example, trying to anneal reactor vessels which will extend the life of reactors.

It has been done. It is not a technology that is new. But it is something where one has to go through in a very disciplined, rigorous manner and demonstrate that one does get the benefits of annealing to get more ductile material as a result of neutron radiation of the steel. So we are working in a cooperative program.

And, in fact, one of the things we have learned in our exchange with the Russians is that they have a technique for annealing reactor vessels; and we are, in fact, going to invite them to this country to assist in demonstrating their technique; and we are going to compare it to the U.S. technique.

Mr. MYERS. Don't we have one at Argonne now, a program—metallurgical program at Argonne National Lab?

Mr. HUNTER. Yes, Argonne is——

Mr. MYERS. Well, I realize I have been somewhat critical. I realize that there are other things. And you came here voluntarily today—maybe not voluntarily. You came here as a substitute for somebody. So I apologize. I don't mean to get on you with both feet, just one maybe, but we appreciate your statements.

Joe, do you have anything else?

Mr. KNOLLENBERG. All set. Thank you.

FUTURE ENERGY NEEDS

Mr. MYERS. We appreciate your answering the questions today. I think all of us share a concern about the future, being able to supply available energy at a price we can afford to pay. And I am just a little worried right now that we have narrowed our vision down to the point where we may not be able to have those alternatives. I guess—I hate to blame the utilities. I know I talk to a lot of CEOs of utilities, and they say they aren't going to build a coal-fired, either. They are operating some 40 years beyond their lifetime already of the fossil fuel, so they are just saying as long as I can continue to operate on my watch, let the next guy down here—I feel sorry for somebody, and I hate to think that way for the future of these young people on the committee. I hate to tell them they have to come up with the right answers. I would like to get headed in the right direction before some of us leave. That is my concern right now. I am afraid we are narrowing our future down too narrow.

I realize—to be quite honest with you, it seems to me like if we are going to spend $100 million, I believe right today I would a lot rather see us spend it on our own future than worrying about the safety of a reactor in the Soviet Union or paying for housing for them or something as we are doing right now. I think maybe our priorities might be a little bit distorted. That isn't your——

Mr. HUNTER. I would like to respond, if I may, sir. It does look like an investment that maybe is getting outside the United States, but again 90 percent of what we are doing is U.S. nuclear industry involved in trying to deal with the situation. And again we think that if there is any incident in Russia it is going to come right back and haunt us here in the United States in terms of our ability to have available a nuclear option for our utilities after the turn of the century.

I think any further incidents will just make people too apprehensive to get into this technology, and this technology is one that I think we have already shown can be productive. It helps balance the energy mix of the United States.

We are currently producing 21 percent of the electric power in the United States with nuclear. And it seems—it should be, I think, again on a personal level since I spent my entire career in nuclear, it seems to me like it should be an option for the United States, and it should be available for the future.

Mr. MYERS. I don't disagree. It is nice to do, and we have an interest in it. But you are going to be haunted by that, and I hope you are not haunted by your children and grandchildren saying, "Grandpa, why did you fail us? Why do we have to turn the lights out? Why are we not being able to be competitive in the world because we don't have the electric energy that you had back in your day?" I hope you are not haunted by that, either. That is the thing I am concerned about.

I think our priorities must start at home. And I think we have to help them when we can, but I think charity starts at home. That is where you and I somewhat—I understand what you are saying, and I don't disagree that we are concerned. We are all on the same planet. But we also are running a risk for our future here, too.

Well, thank you very much for your testimony, and a number of us have additional questions we will provide for the record for you or someone to answer.

Mr. MYERS. Thank you very much for your cooperation today.

Mr. HUNTER. Thank you for having me.

Mr. MYERS. The committee will stand in recess until 10:00 tomorrow morning at which time it will be a classified session.

[The prepared statement of Mr. Hunter and the questions and answers for the record follow:]

NUCLEAR ENERGY RESEARCH AND DEVELOPMENT

Mr. Myers. You have indicated that the Office of Nuclear Energy is the "central home" for the Federal government's expertise in nuclear engineering and technology. In addition, the Department is working to maintain the nuclear option for the country; but the only technology being supported in the FY 1996 budget is the Advanced Light Water Reactor. In fact, over 70 percent of the FY 1996 budget for Nuclear Energy is for non-R&D activities, such as shutdown of facilities, landlord support, and Soviet-designed reactor safety initiatives. Is it possible for the U.S. to maintain a viable Nuclear Energy program with a focus on just one technology with an annual budget of $50 million?

Mr. Hunter. The Department's emphasis in nuclear reactor technology has changed significantly over the past several years. Our efforts are now focused on technologies that are relevant to commercial markets. It has been the practice of many Federal Government programs to develop technologies and attempt afterward to find someone in the private sector to commercialize it. Our program is driven by the needs specifically contemplated by industry. We are performing development work in a direct partnership with nuclear vendors and, more importantly, electric utilities who might someday deploy advanced light water technology. We know that industry is interested in this technology because they are providing more than half the total program funding. Budget priorities require that the Department focus its limited resources in the areas that are most relevant. Because no similar industry interest and commitment has been demonstrated, the Integral Fast Reactor/Actinide Recycle program is being discontinued and the Department has recommended that work on the high temperature gas-cooled reactor program be terminated. Therefore, the focus of the Department's efforts continues to be on the advanced light water reactor (ALWR) technology, which is the only nuclear technology that the electric utilities are likely to build in the next several decades.

The Department is requesting $49.7 million for the LWR program. This funding, leveraged by cost-sharing from industry, will permit the Department to conduct a broad program to preserve existing reactors and provide for the availability of ALWRs by the end of the decade. The Department believes that this industry supported research activity reflects an appropriate, cost-effective Government role in the nuclear energy area.

Mr. Myers. When will the certification activities for the four Advanced Light Water Reactor plant designs be completed and the designs available for purchase? At this point, what role will DOE play in the Advanced Light Water Reactor program?

Mr. Hunter. Nuclear Regulatory Commission (NRC) design certification of the four advanced light water reactor designs is expected as follows, based on current schedules and expected NRC rulemaking, public hearings, and publication processes:

Advanced Boiling Water Reactor (ABWR) by December 1995; System 80+ by December 1995; AP600 by September 1997; and the Simplified Boiling Water Reactor (SBWR) by November 1999.

The future role of the Office of Nuclear Energy (NE) in the Advanced Light Water Reactor program will be focused on completing the First-of-a-Kind-Engineering (FOAKE) programs for the ABWR by December 1995 and the AP600 by December 1997. There are follow-on activities that are under consideration by the Department and the industry. Final program recommendations will be developed and provided as part of our FY 1997 budget proposal.

Mr. Myers. The FY 1996 budget for the Advanced Light Water Reactor program is below the FY 1995 level due to the extension of the safety review schedule for the passive design ALWR. What caused the slip in the schedule?

Mr. Hunter. Several factors caused the slip in the safety review schedule. Manpower limitations at the Nuclear Regulatory Commission (NRC) necessitated holding the passive Advanced Light Water Reactor (ALWR) safety reviews after the evolutionary plant reviews. Since these reviews took longer than expected, the overall program schedule was impacted. Further, the passive ALWR Testing Programs received intense scrutiny, which led to extensive revision and the performance of additional testing, adding additional delays. Finally, resource limitations at GE caused the Simplified Boiling Water Reactor (SBWR) Program to be divided into two phases. Phase I is the completion of the testing and analyses supporting the basic SBWR Technology. Phase II is the resumption of NRC design review activities. This approach both conserves resources and reduces technical risk, albeit at the cost of schedule delay.

Mr. Myers. What is next in Nuclear Energy R&D after the Advanced Light Water Reactor certification efforts are completed?

Mr. Hunter. The Office of Nuclear Energy is considering a number of program options to follow-on the current Advanced Light Water Reactor (ALWR) work scope. There are a number of technology items that are under examination, supporting both existing reactors and ALWR designs. For example, consideration is being given to expanding the FOAKE program to include the other two ALWR designs (System 80+ and SBWR). Also planning is underway on efforts that would address the long construction times and high initial plant costs currently associated with nuclear plants. We are and will continue to work closely with the industry to determine where Government participation is warranted and required. A key requirement for any future programs will be substantial cooperation and co-funding with industry.

Mr. Myers. What is the status of the Department's activities in support of developing methods for implementing the NRC license renewal process?

Mr. Hunter. The Office of Nuclear Energy has been and will continue to provide input to the Nuclear Regulatory Commission (NRC) on the License Renewal Rule, the supporting Environmental Rule, and the associated regulatory guidance and implementing criteria. We have conducted and will conduct further technical evaluations of key plant structures, systems, and components as input to the NRC regulatory guidance. In addition, we are working with industry to perform age-related degradation evaluations. We are also working to resolve generic safety issues that support plant operation beyond the 40-year license period.

Mr. Myers. What is the timeline for this program (License Renewal)?

Mr. Hunter. The Nuclear Regulatory Commission (NRC) expects to issue its revised License Renewal rule by September 1995. The supporting Environmental Rule will be issued by January 1996. DOE is providing utility support so that the first utility license renewal application could be made by the end of 1998. If this happens, the first NRC license renewal could be approved by the year 2002.

Mr. Myers. What is the contribution of each of the participants, DOE, NRC, and industry?

Mr. Hunter. Technical and regulatory issues related to license renewal activities are addressed jointly by the Department of Energy (DOE) and industry. Industry participation is provided through the reactor vendor owner's groups, Electric Power Research Institute, Nuclear Energy Institute, American Society of Mechanical Engineers, American Nuclear Society, foreign and domestic utilities, and a number of international organizations. While the Department provides $3.5 million in FY 1996, the industry contribution to the program totals $20 million.

NUCLEAR TECHNOLOGY RESEARCH AND DEVELOPMENT FUNDING AND TIMELINE

Mr. Myers. For each of the activities in the nuclear technology R&D program, provide the fiscal years 1995 and 1996 funding and a timeline for completion of each activity.

Mr. Hunter. The funding for the Nuclear Technology R&D program for fiscal years 1995 and 1996 is shown in a table which I would like to insert for the record.. The information follows:

NUCLEAR TECHNOLOGY RESEARCH AND DEVELOPMENT FUNDING
(in Millions of Dollars)

	FY 1995	FY 1996
Technology Development for DOE Spent Fuel Treatment	$13.2	$17.0
Nuclear Safety Activities	8.0	8.2
Decontamination and Decommissioning Technology Development	3.0	3.1
TECHNOLOGY DEVELOPMENT TOTAL	$24.2	$28.3
Facility Support	7.4	7.6
Management Studies, Evaluations, and Other Support Activities	0	1.4
TOTAL	$31.6	$37.3

Our spent fuel technology program objective is to complete the development of electrometallurgical treatment technology for application to a broad range of DOE spent nuclear fuel types by the end of FY 1998. A decision will then be made regarding the use of this technology for the treatment of DOE spent fuels. The National Academy of Sciences is conducting a review to assess whether this technology holds sufficient potential for treating DOE spent fuel to warrant further research and development. A preliminary assessment report provided by the committee in February 1995 supports the continuation of research and development activities through FY 1996. A final report is due from the committee in May 1995.

The nuclear safety activities are directed towards initiating cooperation on nuclear safety technologies with other nations and investigating ways to improve the safety of existing and advanced light water reactors and fuel cycle facilities in the United States. Therefore, the program completion date depends on the need for support for the safety activities, which will be evaluated continuously.

The primary goal of the decontamination and decommissioning activities is to develop, test, and validate the full range of methods used for safe and cost-effective decontamination and decommissioning of nuclear facilities. An aggressive activity is anticipated which will share these technologies with the private sector and other U.S. Government programs. This program will continue through the end of FY 1998.

Mr. Myers. What activities are conducted with the Electric Power Research Institute?

Mr. Hunter. We continue to work with Electric Power Research Institute (EPRI) on the design certification program and the First-of-a-kind (FOAKE) engineering programs, which will make available to the marketplace advanced light water reactor (ALWR) designs. These designs will not only fully meet Nuclear Regulatory Commission safety requirements, but will also provide better cost predictability and construction scheduling certainty. This predictability and certainty will permit potential buyers to consider nuclear energy for their base-load electricity requirements. This effort also includes DOE assistance in determining generation costs of new ALWRs compared to other sources of generation.

We cooperate with EPRI on the Plant Lifetime Improvement program. Initiatives include the demonstration of Reactor Pressure Vessel Annealing, research into major reactor component reliability, Instrumentation and Control Systems upgrades, and other reactor improvements.

In addition, the Department of Energy and the EPRI have entered an agreement for a "Sustainable Electric Partnership," that was signed in October, 1994, establishing a goal for formal cooperation in areas including nuclear technology research. Joint nuclear research has yet to start, but we have begun to assess potential projects that appear to provide the greatest chance for success, such as nuclear waste and spent fuel management.

STATUS OF TERMINATION ACTIVITIES

Mr. Myers. What is the status of the termination activities for the Integral Fast Reactor (IFR), the Gas Turbine-Modular Helium Reactor (GT-MHR), the Liquid Metal Reactor (LMR), and the Experimental Breeder Reactor-II (EBR-II)?

Mr. Hunter. The GT-MHR design effort was funded at $11.3 million in FY 1995 and is on-going. The program has been recommended for termination in FY 1996, and, if approved, termination activities will commence on October 1, 1995. The IFR and Actinide Recycle programs were terminated on October 1, 1994. Archiving of experimental data and completion of documentation is being conducted to make the R&D results available for future applications and to satisfy commitments made in collaborative agreements with

Japan. The Advanced Liquid Metal Reactor (ALMR) design contract with General Electric will be brought to a close on March 31, 1995. The EBR-II was shut down on October 1, 1994. The defueling of the reactor is approximately 20% complete. Defueling is scheduled to be completed in March 1997.

NUCLEAR TECHNOLOGY RESEARCH AND DEVELOPMENT ACTIVITIES

Mr. Myers. The budget includes $37 million to cover the redirection of Argonne National Lab resources to higher priority missions of the Department. What specific nuclear energy activities are envisioned for Argonne?

Mr. Hunter. The Nuclear Technology R&D activities at Argonne National Laboratory include technology development for potential treatment of DOE spent fuels, technology activities to improve nuclear safety in the U.S. and internationally, and development of advanced decontamination and decommissioning technologies.

Mr. Myers. Does the redirection of Argonne resources include people and facilities? If so, how many positions and what facilities will be involved?

Mr. Hunter. Approximately 400 FTE's are being utilized on the Nuclear Technology R&D program. Facility support is being provided by the Hot Fuels Examination Facility, Fuel Cycle Facility, Analytical Laboratory, and other facilities at Argonne National Laboratory-West; and by various glovebox and laboratory facilities at Argonne National Laboratory-East.

Mr. Myers. What is the status of the National Academy of Sciences study to evaluate the electrometallurgical technology to treat spent fuel?

Mr. Hunter. The NAS Committee provided an interim report to DOE in February, which concluded that "electrometallurgical techniques represent a sufficiently promising technology for treating a variety of DOE spent fuels to warrant continued R&D in federal FY96." A final report will be provided to DOE in May, 1995.

Mr. Myers. How much is included in the FY 1996 budget for this work on spent fuel treatments?

Mr. Hunter. The FY 1996 funding request for Nuclear Technology Research and

Development contains $17 million for spent fuel treatment technology development. An additional $7.6 million is included to fund facility support needed to perform nuclear R&D at ANL.

Mr. Myers. How is the Argonne work on spent fuel coordinated with other spent fuel efforts in the Department?

Mr. Hunter. The spent fuel work is being coordinated with the Office of Environmental Management. That office is responsible for the preparation of the Department's Spent Nuclear Fuel Environmental Impact Statement, which addresses options for handling the Department's spent nuclear fuel. Additionally, the Office of Fissile Material Disposition has been briefed on the spent fuel technology being developed at ANL.

Mr. Myers. What other technologies are being reviewed as potential treatments for DOE spent fuel?

Mr. Hunter. Electrometallurgical technology is the only spent fuel treatment technology being reviewed by the Office of Nuclear Energy. The Office of Environmental Management is reviewing other spent fuel treatment technologies, and has prepared a DOE Spent Nuclear Fuel Technology Integration Plan. The technologies being reviewed by the Office of Environmental Management include a chlorine volatility process, a glass material oxidation and dissolution system, and enhanced extraction and radionuclide removal technologies, as well as the traditional liquid dissolution technology used in the PUREX and other processes.

SPACE REACTOR POWER SYSTEMS

Mr. Myers. $49 million is requested in FY 1996 for fabrication of components and Radioisotope Thermoelectric Generators (RTGs) to support the NASA Cassini mission planned for launch in October 1997. We understand that an agreement has been reached between DOE and NASA that any future NASA requirements will be funded by NASA, but that DOE will maintain the infrastructure capability to fabricate RTGs. What is the estimated cost to maintain the RTG infrastructure capability and what facilities are involved?

Mr. Hunter. A final agreement regarding funding between agencies is not yet in place, although staff level discussions on this agreement are complete.

Approximately $30 Million of DOE funding is required annually to maintain the RTG infrastructure capability. The facilities that would be maintained include: the fuel pelletization and encapsulation activities at Los Alamos National Laboratory, the heat source and RTG assembly facilities at the Mound Plant, in Miamisburg, Ohio, and the capability to produce iridium components, including the cladding for the fuel pellets, at Oak Ridge National Laboratory.

Mr. Myers. Has NASA committed to funding any future mission requirements?

Mr. Hunter. Funding future missions with NASA has been the subject of several staff level discussions between DOE and NASA. A meeting between the two agencies will be scheduled shortly to resolve specific funding issues for future missions, e.g., Pluto Express.

Mr. Myers. The budget does not include funds in FY 1996 for any additional Plutonium-238 purchases to support the Radioisotope Thermoelectric Generators (RTGs). Is the supply of Pu-238 sufficient to support the FY 1997 Cassini launch?

Mr. Hunter. The existing supply of Pu-238 is sufficient for the Cassini mission.

Mr. Myers. What is the strategy to handle Pu-238 requirements in the future?

Mr Hunter. To meet the projected needs of future NASA missions, the DOE is considering two options: the potential purchase of Pu-238 from foreign sources, or the domestic production of Pu-238 in a DOE owned facility. Pending a decision on long term Pu-238 supply, DOE has purchased 9.1 kgs of Pu-238 under the existing contract with the Mayak Production Association, Russia. This Pu-238 will supplement the post-Cassini inventory to meet future mission needs.

Mr. Myers. In FY 1995, $10 million was reallocated from future mission activities to the current Cassini activities. What caused the program delays at Los Alamos National Laboratory and the Savannah River Site?

Mr. Hunter. The delay at Savannah River was associated with unanticipated startup problems with equipment and operating procedures in H Canyon and HB line that reduced fuel processing output levels below expected processing rates. Necessary adjustments were made and implemented and planned output rates were achieved and sustained.

LANL had to wait to receive sufficient fuel from Savannah River to fully implement their planned production rate of fuel pellets and welded fueled clads. Startup operations also limited production rates and production was below expected levels. Fuel availability and operating experience have increased production rates to planned levels.

The operations at Savannah River and LANL were critical path items for the Cassini mission and required additional effort to recover schedule. The reallocation of $10 million allowed us to reach a steady state processing rate of 2.5 kgs per month at Savannah River, and to fabricate pellets at the rate of 30 per month at Los Alamos National Laboratory. SR processing activities for Cassini will be complete in June 1995, and activities to make pellets at LANL will be completed in September, 1995.

INTERNATIONAL ACTIVITIES

Mr. Myers. DOE's support to the Soviet-Designed Reactor Safety Program has increased in FY 1996 to $78 million. What are the specific activities performed by the Department in support of this initiative?

Mr. Hunter. The Department of Energy's $78 million budget request is for the International Safety Program, a cooperative effort which links us with partners in other countries to improve nuclear safety worldwide. Approximately three-fourths of this budget is focused on improving the safety of Soviet-designed reactors. Approximately ninety percent of this funding will be expended in enlisting U.S. companies to support these activities.

The program for Russia, Ukraine, and Central and Eastern Europe focuses on five elements that are critical to achieving lasting improvements in nuclear safety culture and infrastructure in these countries.

The first includes improving capabilities of nuclear plant operators, establishing sound operating procedures, and developing methods for responding to abnormalities. Specific projects include training courses, development of Emergency Operating Procedures, and provision of simulators and other training hardware.

The second element involves improving the physical condition of plants, particularly safety systems. Upgrades are done on demonstration plants, while simultaneously training and technology transfer are conducted. Specific projects include upgrading fire safety systems and systems for preventing radiation leaks.

The third element involves establishing a capability to analyze safety and make sound decisions about upgrades, operation, and shutdown. Projects include providing hardware, software, and training.

The fourth element is providing technical support for identifying and resolving safety issues related to spent fuel storage at nuclear energy plants.

Finally, we are assisting these countries in establishing a domestic liability regime and in becoming members of an international liability regime to allow broader involvement of western private sector and strengthen indigenous regulators.

Mr. Myers. How can we measure the benefits of this assistance?

Mr. Hunter. Demonstrating success is a key element of this program, and we have developed specific performance measurements for each technical work area. These include, for example, numbers of operators passing certified training courses, the number of remedial measures identified, started, and completed in the host country, the number of codes qualified for use on Soviet-designed reactors, the number of new operating procedures implemented, and the adoption of legislation to deal with liability concerns.

Mr. Myers. By year, what is the total funding to be provided by the United States for this international effort?

Mr. Hunter. I would like to insert into the record this chart, titled "International Nuclear Safety Program - U.S. Funding by Year" in response to that question.

INTERNATIONAL NUCLEAR SAFETY PROGRAM
U.S. FUNDING BY FISCAL YEAR
March 28, 1995 ($M)

Federal Agency	FY 91	FY 92	FY 93	FY 94	FY 95	FY 96	FY 97	FY 98	TOTAL
Department of Energy (DOE):									
New Independent States (NIS)	$ 0	$ 21.90	$ 35.00	$ 75.00	$ 8.50	$ 78.50	$ 70.00	$ 56.00	$ 344.90
Central and Eastern European Countries	1.10	2.85	3.60	3.60	0	8.75	10.00	10.00	$ 39.90
Subtotal	$ 1.10	$ 24.75	$ 38.60	$ 78.60	$ 8.50	$ 87.25	$ 80.00	$ 66.00	$ 384.80
Nuclear Regulatory Commission (NRC):									
New Independent States (NIS)	$ 0	$ 3.10	$ 5.00	$ 11.00	$ 1.50	$ 1.50	TBD	TBD	$ 22.10
Central and Eastern European Countries	0.73	$ 0.90	$ 1.62	$ 1.50	$ 1.50	TBD	TBD	TBD	$ 6.25
Subtotal	$ 0.73	$ 4.00	$ 6.62	$ 12.50	$ 3.00	$ 1.50	TBD	TBD	$ 28.35
Total	$ 1.83	$ 28.75	$ 45.22	$ 91.10	$ 11.50	$ 88.75	$ 80.00	$ 66.00	$ 413.15

(1) All funding for FY 92 through FY 95 and $10 million of FY 96 funding are transfers from USAID.

(2) $78.75 million of the FY 96 funding and all later funding are from the DOE budget.

(3) $30 million of FY 94 funding was received by DOE from USAID on the last day of fiscal 1994 and will be used in fiscal 1995. The remaining $45 million of FY 94 DOE funding for the NIS will be transferred from USAID in April 1995.

Mr. Myers. How is this funding split by federal agencies?

Mr. Hunter. The chart, titled "International Nuclear Safety Program, U.S. Funding by Fiscal Year," provided for the previous question addresses that question also.

Mr. Myers. How many reactors are involved in the assistance program?

Mr. Hunter. Our program is designed to eventually improve safety at all 66 Soviet-design reactors. Our focus is on improving the safety of reactor types rather than individual reactors and strengthening the national nuclear safety infrastructure. Currently, U.S. nuclear safety experts and vendors work with the operators at a total of 13 sites in Russia (five), Ukraine (three), and Central and Eastern Europe (five) in improving the operations and physical condition at the plants. In most cases, work is underway at one or more reactors at these sites, or training programs and operating procedures are being implemented that will apply to all reactors at a site.

Mr. Myers. What guarantee is there that assistance efforts will result in safer reactors or expedite the closure of the riskiest reactors?

Mr. Hunter. The United States works with its counterparts in countries operating Soviet-designed reactors to identify priority needs for safety improvements. Where needs for hardware improvements are identified, priority is placed on improving safety systems, such as fire safety systems and systems for preventing radioactive leaks. Upgrades are done on a demonstration plant, while training and transfer of manufacturing capability are conducted to ensure that safety improvements are replicable.

But design and safety system improvements alone will not result in safer plants. Operator training, procedures, and the conduct of operations are keys to safer operation, and U.S. efforts have already produced significant improvements. Another key is the sharing of operational experience among sites. The U.S. program has focused on facilitating such exchanges. And in order to ensure that indigenous professionals involved in the design, operation, and regulation of nuclear plants are also able to prioritize safety needs and make sound decisions about the continued operation or shutdown of the plants, we work with them to provide the techniques and expertise to conduct safety analyses that meet western standards.

Finally, our efforts to implement the June 1994 agreement on shutdown of Russia's plutonium production reactors may result in the closure of three of Russia's riskiest reactors and will help reduce the world's supply of weapons-useable material.

Mr. Myers. How is assistance directed to impact the highest safety risk reactors first?

Mr. Hunter. We and our colleagues work with the international community and international organizations like the International Atomic Energy Agency to develop the necessary baseline information, such as performance histories and individual unique design characteristics, to make informed decisions about the relative safety of Soviet-designed reactors. There has been general agreement that work should be focused first on the oldest designs of Soviet reactors, the RBMK and VVER 440/230 designs.

In determining the types of safety improvements of most importance, consideration must also be given to such factors as operation and maintenance practices at each reactor, location of the reactor relative to population centers and food and water sources, and original design of the reactor.

Mr. Myers. Is there agreement between the Russians and the donor countries as to what types of safety improvements are most important?

Mr. Hunter. Improvements are being made on three fronts: by countries with Soviet-designed reactors, through bilateral cooperation with these countries, and by multilateral activities, via the nuclear safety account at the European Bank for Reconstruction and Development.

There is general agreement between Russia and donor countries on what safety improvements should be made, and we work cooperatively with the host countries to prioritize safety needs and to identify programs, such as the development of emergency operating procedures or training programs, which can be applied to entire types of reactors, rather than targeted for a single reactor.

Mr. Myers. Can the U.S. dictate what types of improvements are to be made first?

Mr. Hunter. The United States has established five categories of activity that we believe comprise an effective approach to improving safety, including management and operations, engineering and technology, plant safety evaluation, fuel cycle, and legislative and regulatory framework. We work with our counterparts in countries operating Soviet-designed reactors to develop projects in these areas. While we often agree on the types of improvements which should be made first, final decisions on resource allocation are made in the United States.

Mr. Myers. Which reactors should be addressed first to meet safety standards?

Mr. Hunter. The RBMK and VVER-440/230 reactors are addressed first, as they are the earliest design and have various design deficiencies, such as a lack of containment structures. These reactors are targeted for the majority of fire and safety system upgrades.

Mr. Myers. Please describe the DOE role in the Russian Replacement Power Initiative.

Mr. Hunter. The Department of Energy works with the Department of State, Arms Control and Disarmament Agency, Nuclear Regulatory Commission, and National Security Council to implement the June 1994 agreement on shutdown of the plutonium production reactors at Tomsk and Krasnoyarsk. The coordinator for this effort is a Department of Energy representative. The Department provides technical leadership in identifying replacement options for the heat and electricity provided by these reactors and works with the Department of State on developing procedures, such as monitoring activities, for verifying compliance with the agreement.

Mr. Myers. Is it correct that DOE has the responsibility to assist the cities of Tomsk and Krasnoyarsk-26 in obtaining financing for shutdown of the reactors and funding for replacement power systems?

Mr. Hunter. The Department of Energy has helped to arrange two feasibility studies, one funded by the U.S. Trade and Development Agency, on fossil replacement power and nuclear replacement power systems. These feasibility studies will provide the information needed to identify investment funding, from private sources or international financial institutions, for implementing the selected option.

Mr. Myers. Exactly what is involved in that responsibility?

Mr. Hunter. In addition to arranging two replacement power feasibility studies, which will provide information necessary to obtain funding, the Department will assist Russia in addressing the social and economic dislocation associated with the shutdown of a production reactor.

Mr. Myers. Please discuss the liability issue which impacts U.S. contractors participating in this program.

Mr. Hunter. Most companies that were concerned about liability have been satisfied that the bilateral agreement between Russia and the United States and Vice President Gore's letter of assurance of U.S. government support provide adequate indemnification. Work is going forward under the program. We are also working with our Russian colleagues on developing a law for consideration by the Russian parliament that would establish the domestic liability regime necessary for full participation by American firms in commercial nuclear cooperation.

UNIVERSITY SUPPORT PROGRAM - UNIVERSITY REACTOR FUNDING

Mr. Myers. How much is included in the FY 1996 budget to provide the fuel, transportation of spent fuel, conversion of Highly Enriched Uranium (HEU) fuel cores to Low Enriched Uranium (LEU), and safety maintenance to support the university research reactors?

Mr. Hunter. The FY 1996 budget request provides $2.2 million for fuel supply activities, $200,000 for transportation of spent fuel, and $1.2 million for HEU to LEU conversions and safety maintenance. A schedule for the conversion of remaining HEU-fueled university reactors to LEU fuel and a detailed plan for DOE support of safety maintenance activities at university reactors are being developed.

Mr. Myers. Will this support all required safety maintenance activities?

Mr. Hunter. The Office of Nuclear Energy is conducting a survey of all university reactors, to determine the required safety maintenance activities at each facility. The results of this survey will be used to develop a plan for future DOE support of university reactor safety maintenance activities.

Mr. Myers. How much is included in the FY 1996 budget for education activities?

Mr. Hunter. $2.5 million was requested for education initiatives, including $1.0 million for nuclear engineering and health physics fellowships, $800,000 for the DOE/Utility cost shared research grants program, and $700,000 for the University Reactor Sharing program.

Mr. Myers. How does this compare to prior year funding levels?

Mr. Hunter. Prior year funding levels for these education activities are shown in a table which I would like to insert for the record. The information follows: .

HISTORICAL FUNDING FOR EDUCATION ACTIVITIES
(in Millions of Dollars)

	FY 1993	FY 1994	FY 1995	FY 1996
Nuclear Engineering/Health Physics Fellowships	$0.4	$0.5	$0.5	$1.0
Nuclear Engineering Research Grants	3.5	0	0	0
DOE/Utility Matching Grants	0.8	0.5	0.8	0.8
University Reactor Sharing Program	0.6	0.5	0.5	0.7
TOTAL	$5.3	$1.5	$1.8	$2.5

The nuclear engineering/health physics fellowships program has been managed by the Office of Nuclear Energy. All of the other programs were managed by the Office of Science Education and Technical Information through FY 1994. Management responsibility for these programs was transferred to the Office of Nuclear Energy in FY 1995.

ISOTOPE PRODUCTION AND DISTRIBUTION

Mr. Myers. Funds are included in the Department's FY 1996 budget for facility modifications to produce Molybdenum-99 (Mo-99) isotopes. The Department is developing this capability to produce this isotope due to uncertainty of the existing supplier. What are the forecasted revenues for this isotope?

Mr. Hunter. The first revenue from the sale of Mo-99 is expected to be $2 million in fiscal year 1997. Outyear revenues are projected to grow to $7-9 million per year and stabilize at that level. The demand for Mo-99 has grown by five to ten percent annually, and this trend is expected to continue for the foreseeable future.

Mr. Myers. What happens to the Department's projected revenues if the existing supplier resolves its production problems?

Mr. Hunter. The one North American reactor that produces molybdenum-99 (Mo-99) is the 37-year old National Research Universal (NRU) reactor which is operated by Atomic Energy of Canada, Limited (AECL). The one North American distributor of Mo-99, Nordion International of Canada, supplies 100 percent of the North American market, and can be expected to maintain their present production capacity. Nordion receives all its Mo-99 from the AECL's NRU reactor.

Assuming the current negotiations between Nordion and AECL to build a new isotope production reactor (the Maple-X) are successful, the NRU would then be shut down. This would still leave only one reactor producing Mo-99 in North America, and Nordion as the only North American distributor of Mo-99.

The DOE Mo-99 project has been undertaken at the request of the Nation's medical community to improve the reliability of supply by providing a backup source of Mo-99. The Mo-99 project goal is to produce 20 to 30 percent of the North American demand on a continuous basis, and also have the capability to provide 100 percent on short notice for periods of at least four weeks. The Isotope Program anticipates that the market will welcome a second supplier, and we expect that our revenue projections will remain valid.

Mr. Myers. What has the recent trend been for the sales of isotopes?

Mr. Hunter. The $10 million of revenue reported in the Isotope Program and Distribution's fiscal year 1994 Financial Statements was the lowest revenue earned by the Program since its inception. This is mostly attributed to the emergence of the former Soviet Union (FSU) as a supplier of stable isotopes. Since the FSU is selling isotopes from its large existing inventory, it has been able to sell at prices below our production cost and capture a significant market share. However, the Program recently signed a multi-year contract for several millions of dollars for the sale of stable isotopes. This sale will recover some of our lost market.

Sales of short-lived radioisotopes have also received heavy competition from the former Soviet Union and the Canadians. We are also seeking multi-year contracts and large volume purchases for short-lived isotopes, which should result in higher revenue, lower unit cost, and lower prices. Our current revenue projections for this fiscal year indicate a $3 million dollar increase over last year's revenue.

Isotope sales projections are dynamic and require frequent modifications, because they are dependent on successful evaluation of very volatile market.

Mr. Myers. Are there any examples where DOE had to restart facilities to satisfy demand?

Mr. Hunter. The calutrons at the Oak Ridge National Laboratory were restarted on January 3, 1995, to produce isotopes required for medical and research applications. Inventories of several isotopes had reached very low levels, and new demand for these isotopes had become apparent.

The following medical isotopes being produced in fiscal year 1995 at this restarted facility: thallium-203, which is target material for commercial production of thallium-201, used for cardiac imaging, and zinc-68, which is target material for commercial production of gallium-67, used for soft tumor scanning and diagnosis of Hodgkin's Disease.

The Isotope Program anticipates that the calutron operations will break even on an annual basis by producing these high-demand isotopes and also allow the Department to replenish supplies of the isotopes most in demand by researchers.

Mr. Myers. Your statement notes that this program is operated as a business, but it is subsidized by annual appropriations. Why is a subsidy necessary?

Mr. Hunter. The Isotope Program is requesting annual appropriations to supplement its revenues to provide both continued financial stability and to allow the continued implementation of the National Isotope Strategy.

The National Isotope Strategy established two primary missions for the Isotope Production and Distribution Program. The first mission is to produce and distribute certain isotopes for research and development, medical diagnostics and therapy, and other applications that are in the National interest, at prices that ensure reasonable compensation and encourage research. Because demand for many of these isotopes is often small and erratic, and requires several unique expensive processes, the isotopes are generally unprofitable and have not been commercialized by U.S. manufacturers. This mission is important to U.S. research in many fields and cannot be accomplished without support from annual appropriations.

The second mission is to produce and distribute other isotope products and services that are in demand on a businesslike basis. This task is accomplished by producing selected high-volume isotopes in unique Department of Energy facilities and selling them into the commercial market. Prices for these products are established based on a number of factors, including production costs, market values, and payback analysis. For high volume products, the market allows the program to recover its costs, thus obviating the need for federal support for this particular segment. These high-volume isotopes generally achieve full-cost recovery on an annual basis; however some require multi-year periods to achieve full-cost recovery.

Mr. Myers. What would happen if the Department were required to sell isotopes at the full production cost?

Mr. Hunter. The Department produces a wide variety of isotopes. If the Isotope Program was not subsidized, the Department would be forced to produce a limited number of isotopes for which the demands are large, steady, and profitable. This would lead to increasing charges to research users to cover program expenses for the production and distribution of isotopes needed for research, where demand is small, erratic, and unprofitable. Foreign suppliers could be an alternative source; however foreign suppliers have been unwilling to provide small quantities of the large variety of isotopes demanded by U.S. isotope customers. Most likely, this would make many isotopes unavailable for the research institutions--generally U.S. universities--that need them most.

The Isotope Program was required to recover full costs during fiscal year 1990-1994 under Public Law 101-101. The effect of this requirement was to force a concentration on high-volume isotopes with profit potential and narrow the range of isotopes produced by the Department. This mode of operation disrupted the availability of isotopes, especially those needed for research.

Mr. Myers. Why can foreign countries produce isotopes less expensively than the U.S.?

Mr. Hunter. The isotopes the Department produces are manufactured in unique facilities; nuclear reactors, large accelerators, and calutrons. The isotopes are produced as byproducts of other government activities. This is true of the United States as well as foreign governments, but the degree of subsidization for isotope production varies from case to case. Based on our current knowledge of production costs and market prices, there is no evidence that many of our foreign competitors, in the world market, recover the full cost of production. As a result, the market price for many isotopes, we believe, is artificially low.

As an example, since 1990, the States of the Former Soviet Union have sold isotopes from their large inventories at prices below our production costs, directly competing with our Isotope Production and Distribution Program in the U.S. and in foreign markets. This will continue until inventories are depleted. Another major isotope supplier, Nordion International of Canada, has favorable arrangements with the Canadian Government for the production of molybdenum-99 and some other medical isotopes.

Mr. Myers. Are there institutional barriers that keep U.S. companies out of the market?

Mr. Hunter. Currently, U.S. companies are not entering the isotope production market because the cost of nuclear facility construction and operations cannot be recovered in a reasonable period of time. In addition, there are regulatory uncertainties associated with the protection of public health and safety and the conduct of nuclear facility operations that raise entry barriers for potential producers. The potential for high costs to dispose of radioactive and hazardous waste is also a factor.

Until 1989, the U.S. supply of molybdenum-99 was obtained from two manufacturers, Cintichem, Tuxedo, New York, and Nordion International, Ontario, Canada. Cintichem supplied almost 50 percent of the U.S. market for molybdenum-99. In 1989, Cintichem operations were halted when radioactive contamination was found in the storm drain system. After an evaluation of the reactor status and coordination with the Nuclear Regulator Commission, Cintichem reached a business decision in February 1990 to decommission the reactor rather than to repair and requalify it for further production. The demise of the Cintichem supply left the U.S. totally reliant upon a single foreign source.

Mr. Myers. Please provide an object class breakdown of the funding in this program.

Mr. Hunter. An object class breakdown of the Isotope Decision Unit is shown in a table which I would like to insert for the record. The information follows:

($ in Thousands)

Object Class Breakdown	FY 95 Estimated	FY 96 Estimated
Full Time Permanent	973	1,012
Other Personnel Compensation	14	16
Total	987	1,028
Benefits	238	248
Travel	75	80
Other Services	18,193	24,002
Total	19,493	25,358

Mr. Myers. Why have the FTEs associated with this program increased from 6 in FY 1994 to 12 in FY 1995?

Mr. Hunter. The Isotope Program's organization was restructured, consistent with the National Isotope Strategy. By the close of FY 1995, the Isotope Production and Distribution Program staff will total 12 Headquarters (HQ) FTEs, including 10 professionals and two secretaries. Twelve HQ FTEs are the minimum staffing considered adequate to manage a $30 million revolving fund with operations at seven Department of Energy laboratory locations. Before this restructuring, the Isotope Program had insufficient staff to properly manage and monitor marketing, operating, and cost activities.

As a whole, the Office of Nuclear Energy will meet or exceed all streamlining objectives set down in the National Performance Review.

Mr. Myers. By year since fiscal year 1985, please list the revenues received from the sale of isotopes and the total expenses of the Department's isotope program.

Mr. Hunter. Until fiscal year (FY) 1990, revenues and expenses for isotope activities were the responsibility of various Department of Energy programs and with different appropriations. Thus, this information is not readily available. More importantly, this information is not comparable to the Isotope Production and Distribution Program's revenues and expenses since some product charges were subsidized and because cost allocation methods were different. In 1989, Public Law 101-101 established the Isotope Production and Distribution Revolving Fund with centralized management of isotope activities under the responsibility of the Office of Nuclear Energy. Revenue and Expenses for the Isotope Program are as follows:

($Millions)

	FY90	FY91	FY92	FY93	FY94
Revenues	$15.7	$11.5	$15.0	$11.7	$10.0
Total Operating & Program Cost	$19.2	$16.2	$18.6[2]	$17.1	$14.5
Process Development[1]	$1.1	$4.7	$4.8[3]	$3.0	$0.2
Total Expenses	$20.3	$20.9	$23.4	$20.1	$14.7

1 - The major products in which process development investments were made are cesium-137, yttrium-90, iridium-192, and molybdenum-99 (Mo-99).

2 - Includes $878,000 for Mo-99 feasibility study.

3 - Includes capital expenditures of $750,000 for purchase of technology and equipment from Cintichem.

ENRICHED URANIUM FROM RUSSIA

Mr. Myers. Please describe the purchase of enriched uranium from Russia.

Mr. Hunter. To date, three agreements and a contract relating to the purchase of Russian highly enriched uranium (HEU) have been signed between the United States and Russia. These include the HEU Bilateral Government-to-Government Agreement, signed February 18, 1993; the Memorandum of Understanding (MOU) Relating to Transparency and Additional Arrangements, signed on September 1, 1993; the HEU Purchase Contract, signed on January 14, 1994; and the Protocol on HEU Transparency Arrangements, signed on March 18, 1994.

According to these documents, the United States will purchase approximately 15,300 metric tons of low enriched uranium (LEU) derived from 500 metric tons of HEU over a 20-year period. The contract is being executed by the United States Enrichment Corporation (USEC) as executive agent for the United States Government and has a total value of approximately $12 billion at current prices. The HEU will be blended down to LEU in Russia to meet the specifications for commercial nuclear reactor fuel and delivered to USEC for resale.

The Department is implementing a series of transparency measures to monitor the processing of the HEU in Russia and provide reciprocal monitoring in the United States. These transparency measures are designed to ensure that the Russians will fulfill their obligations under the terms of the HEU Bilateral Government-to-Government Agreement and meet the three nonproliferation objectives relating to the purchase: (1) provide confidence that HEU is derived from dismantled nuclear weapons; (2) provide assurance that the LEU is derived from Russian HEU; and (3) ensure that LEU delivered to the United States from Russia will only be used for commercial power reactors and will never again be used for nuclear weapons purposes.

Mr. Myers. What is the annual funding, schedule, and total cost estimate for this program?

Mr. Hunter. The contract, signed by the United States Enrichment Corporation

(USEC) in January 1994, calls for 10 metric tons of highly enriched uranium (HEU) to be blended to low enriched uranium (LEU) for each of the first 5 years of the contract; and 30 metric tons of HEU to be blended to LEU in each of the remaining 15 years of the contract. As signatory to the contract, USEC is financially responsible for all payments under this contract. While the Department of Energy does not provide any funding for the purchase contract, it is responsible for funding the implementation of transparency measures to increase confidence that LEU is blended down from Russian HEU derived from dismantled weapons. We estimate that this activity will cost the Department approximately $7 million to $8 million annually.

The value of the USEC purchase contract is estimated to be $12 billion. In December 1994, the USEC placed the first order calling for deliveries of LEU to begin in March 1995, with additional deliveries each month thereafter. Although the Russians have not officially accepted the order, they have indicated they will begin blending HEU to LEU during April 1995.

You may wish to contact USEC for more detailed information about the status of this contract.

URANIUM PROGRAMS

Mr. Myers. The United States Enrichment Corporation will submit a plan for privatization of the Corporation. What are the remaining responsibilities of the Department as they relate to the gaseous diffusion plants?

Mr. Hunter. As required under the Energy Policy Act of 1992 (EPACT), the United States Enrichment Corporation (USEC), not the Department of Energy (DOE), is in the process of formulating a privatization plan to be submitted to the President and Congress by July 1, 1995. While new legislation is not required to privatize the Corporation, the Administration is preparing a package of legislative changes that would clarify certain rights and responsibilities of the Corporation and the Government. Draft legislation prepared by USEC is undergoing Administration review.

As a result of EPACT, the Department remains the owner of the gaseous diffusion plants and retains significant responsibilities for operations at the Portsmouth, Ohio, and Paducah, Kentucky, sites. DOE and USEC are bound together by both agreements and a series of legislative provisions that require interdependent activities in many areas. As provided under EPACT, the Department and USEC entered into a six-year lease that sets forth the conditions under which USEC operates the enrichment plants. Under the lease, the Department provides various services to USEC that are reimbursed by USEC and are not reflected in the Department's budget request. Conversely, the Department buys various services, primarily associated with hourly labor, from USEC which are reflected in DOE's budget request.

Among the most important of the Department's USEC-linked activities is nuclear safety regulatory oversight of the gaseous diffusion plants. DOE and USEC are working together closely to ensure the continued safe and efficient operation of the enrichment facilities. EPACT named the Nuclear Regulatory Commission (NRC) as the regulatory authority for the plants. However, the Commission is not scheduled to take over regulatory authority until October 1, 1995. In the interim, the Department is fulfilling the regulatory oversight role at the plants. After that date, DOE will provide consultation to NRC on the health, safety, and environmental conditions at the plants operated by USEC so that NRC may prepare an annual report to Congress on these issues.

In accordance with EPACT, DOE remains responsible for nuclear safety upgrades at the plants to be delineated in the Compliance Plan being prepared by the Department to meet initial NRC standards. These upgrades are estimated to cost between $80 and $120 million and may take between three and five years to complete. Costs of the upgrades to the plants will be paid for with funds included in an FY 1993 Reprogramming Action and through the transfer or sale of excess Departmental inventories of natural and low enriched uranium.

The Department continues to manage the approximately 70 facilities at the Paducah and Portsmouth sites that are not leased to USEC and conducts environmental corrective actions at the enrichment plants that were the result of operations prior to the USEC transition date. The removal of uranium deposits in the Department's highly enriched uranium production facilities at Portsmouth is scheduled for completion in FY 1995. To date, 100 of the 200 highly enriched uranium equipment cells have been treated to remove excess uranium deposits to minimal levels. After this process is complete and highly enriched uranium inventories have been removed from the site or blended to low enriched uranium, surveillance and maintenance will continue until the facility can be decontaminated and decommissioned.

The Department is also managing the Department's depleted uranium hexafluoride (UF_6) inventories at the enrichment plant sites. About 560,000 metric tons of this material, created over the last 30 years of operation, are safely stored at the sites awaiting final disposition. The Department is conducting an ongoing program to ensure the continued integrity of approximately 47,000 UF_6 storage cylinders. To determine the best alternatives for this material for the long term, an Advance Notice of Intent and a request for technology recommendations for the final disposition and uses of the UF_6 have been published in the Federal Register.

Under the terms set forth in EPACT, the Department is responsible for satisfying financial obligations associated with enrichment operations before July 1, 1993. Chief among these obligations are payments for post-retirement life and health benefits to management and operating contractor employees and power supply contractors employees. In addition, the Department is responsible for funding the litigation of approximately 20 outstanding lawsuits involving claims against the Department for its operations at the enrichment plants prior to July 1, 1993.

DOE remains responsible for identifying non-uranium enrichment applications for gaseous diffusion and gas centrifuge technologies. Numerous industries have expressed great interest in commercializing gaseous diffusion and centrifuge technologies for applications other than enriching uranium. The gaseous diffusion membrane developed by the Department has superior technical merits compared to currently available commercial technology. Its improved quality and tolerance to harsh environments have attracted strong interest from U.S. industry involved in separation and filtration processes. DOE is engaged in transfer efforts to gain private sector involvement in developing future uses of these technologies.

It is most important to emphasize that the Department will maintain its ownership responsibility for the Paducah, Kentucky, and Portsmouth, Ohio, gaseous diffusion plants and pre-existing conditions and liabilities even after USEC is privatized. The Corporation will in all cases merely lease the gaseous diffusion plants and eventually return these facilities to the Department for decommissioning and decontamination.

Mr. Myers. Is there any possibility that the Corporation will turn one of the gaseous diffusion plants back to DOE? If so, what is the earliest date that could happen and what would be the funding impact on DOE?

Mr. Hunter. It is possible that the United States Enrichment Corporation (USEC) may return one or both of the gaseous diffusion plants to the Department at some point in the future. Under the lease agreement with USEC for the plants, USEC may terminate its lease for either plant by giving the Department a two-year notice. However, we should emphasize that the Department has received no information about the Corporation's long-term plans regarding the return of the enrichment plants to the Department. You may wish to contact USEC for more detailed information.

If a plant were returned to the Department, the resulting funding requirements will be greatly dependent on the date the plant ceases operating, its condition at the time, and the schedule for decontamination and decommissioning. The primary source of funding will be provided from the Uranium Enrichment Decontamination and Decommissioning Fund. Additionally, USEC will be responsible for the costs associated with incremental contamination since it began operations. The Department is preparing a facility turnover plan that will allow us to develop an estimate of additional funding required when the Department is notified of USEC's plans. This plan will deal with the actions necessary to transition the enrichment plants back to the Department and prepare the facilities for decontamination and decommissioning.

Mr. Myers. What is the status of the transfer of nuclear regulatory oversight responsibilities for the gaseous diffusion plant to the NRC?

Mr. Hunter. In September, NRC issued final standards for certification of the Paducah, Kentucky, and Portsmouth, Ohio, gaseous diffusion plants that become effective in October 1994. As required by the Atomic Energy Act, as amended, the United States Enrichment Corporation must submit an application for certification of the Portsmouth, Ohio and Paducah, Kentucky gaseous diffusion plants to NRC in April 1995.

The Department of Energy must submit a Compliance Plan to NRC in April 1995 that identifies functional areas of the gaseous diffusion plants that are not in compliance with the NRC standards, a plan of action to correct the noncompliances, and a justification for the continued safe operation of the plants until all corrective actions are completed.

Using this information, NRC is scheduled to certify the plants in October 1995. This certification is expected to be conditional upon correction of all noncompliances. After completion of the first certification process, NRC assumes nuclear regulatory oversight of the gaseous diffusion plants.

Mr. Myers. The Department assumes revenues of $400 million from the sale of highly enriched uranium. Please describe the process to sell this material and the schedule for obtaining the revenues.

Mr. Hunter. The Department is preparing an Environmental Impact Statement (EIS) to evaluate the alternatives for the disposition of highly enriched uranium. This EIS will include an analysis of the potential transfer to USEC of approximately 50 metric tons of highly enriched uranium and other uranium materials which have been declared surplus to national defense needs and can be blended together to yield commercially-usable low enriched uranium. The draft EIS will be published this summer with a final EIS and subsequent Record of Decision completed by early 1996.

The Administration's budget for FY 1996 assumes that the United States Enrichment Corporation (USEC) will be privatized in FY 1996. USEC has estimated that the Corporation has a value of approximately $1.5 billion. Should the EIS process conclude that the transfer of highly enriched uranium to USEC is an appropriate alternative, it is expected that this action would increase the value of the Corporation at privatization by approximately $400 million. This differential would comprise the credit anticipated by the Department.

The Department is working out the specific details of the transfer with USEC and expects to transfer the surplus uranium inventories following completion of the EIS and Record of Decision.

Statement Of Ray Hunter
Acting Deputy Director, Office Of Nuclear Energy
Before The
House Committee On Appropriations
Subcommittee On Energy And Water Development

March 14, 1995

INTRODUCTION

Mr. Chairman, I am pleased to have this opportunity to present the Fiscal Year (FY) 1996 budget request for the Department of Energy's (DOE) Office of Nuclear Energy. The Office of Nuclear Energy is the central home for the Federal government's expertise in nuclear engineering and technology. Our activities cover a range of international programs, from working to enhance nuclear safety and providing critical isotopes to health care providers and industry to conducting important nuclear research and development and building the nuclear energy systems needed to explore outer space and support the Nation's defense.

Our expertise in the nuclear energy field, including the management of nuclear facilities, is applied in ways important to the future. Most prominently, we are working to maintain the nuclear option for the country. The Department is focussing its attention on how we can best assure that the United States has a vibrant, diverse supply of energy to power our economy into the twenty-first century. Nuclear energy plays a vital role in our energy mix today and can play an important role in the future. The Office of Nuclear Energy works with industry in a cost-shared program to design a new safer and economical generation of nuclear energy plants. These advanced plant designs will be available for purchase by 1997. We also work with industry to assure that current nuclear plants continue to operate safely and economically well into the next century. We also promote the export of U.S. nuclear energy technology and services overseas and look for opportunities to open new markets.

The programs carried out by the Office of Nuclear Energy support this country's foreign policy and national security objectives. The activities we are pursuing in the former Soviet Union are very important to the stability of that part of the world and contribute in a very tangible way to the reduction of available weapons-usable fissile materials. Our international programs are also crucial to the U.S. industry; it is well-understood that another major nuclear accident in the former Soviet Union could severely hamper the possibility that new nuclear plants, however safe, would be built in this country for a long time. We are also responsible for providing and maintaining nuclear energy systems for the United States Navy and other national security customers.

The Office of Nuclear Energy addresses the concern about proliferation of nuclear weapons too. We are working to implement an agreement to cease production of weapons-grade plutonium in the Russian Federation, and we oversee the blending of highly enriched uranium from dismantled Russian weapons into low enriched uranium for fuel in light water reactors. And, we encourage other countries to develop light water reactors using a once-through fuel cycle instead of civil reprocessing of plutonium.

We manage important nuclear technology programs. Radioisotope thermal generators built by the Office of Nuclear Energy supply power to the spacecraft this country has sent to the outer planets to send back spectacular images of Saturn and Jupiter. In 1997, NASA's Cassini spacecraft, also powered by systems built by the Office of Nuclear Energy, will be launched on a mission to the planet Saturn. We also manage programs to develop new technologies to treat spent nuclear fuel and enhance the safety of nuclear facilities, and we investigate methods to make decontamination and decommissioning more cost-effective and safer.

We are the source of some of the world's most widely-used isotopes in medicine, industry and research. Our program provides hundreds of isotopes to health care providers, scientists, and companies in the U.S. and many other countries. Our current effort to build the only domestic source of molybdenum-99 will lead to an assured supply of the country's most important diagnostic isotope. These and many other efforts underway at the Office of Nuclear Energy demonstrate a commitment to the future well being of this country.

At the same time, we have focused our program on the most important responsibilities. We have reduced our level of effort in some lower-priority areas and eliminated some altogether, including the Integral Fast Reactor (IFR). These decisions have been difficult. For example, the Integral Fast Reactor program had significant support, and previously represented the Office's largest single program. But it was a program without a clear path to deployment--the private sector showed little interest in building IFRs--and it would have cost taxpayers over $3 billion to demonstrate the technology at a large scale. It was an interesting technology, but not one that should be funded by the Federal Government in a time of tight budgets. We have a similar opinion regarding the Gas Turbine Modular Helium Reactor. This technology also has potential advantages that might eventually be demonstrably practical, but there is much expensive work that remains to be done on the Gas Turbine Modular Helium Reactor.

The Integral Fast Reactor is not the appropriate focus for the Department's nuclear energy program. Advanced light water reactor technology, on the other hand, has the potential for near-term returns and represents the only nuclear plant types utilities are likely to build for the next several decades. Moreover, this attractive technology will have considerable export potential. A vital component of our mission is to position these plants to contribute to the U.S. energy mix before the end of the decade.

The total FY 1996 congressional budget request of $425.1 million also includes the costs of terminating several low-priority programs. (While the Office of Nuclear Energy manages the $682.2 million program to build and maintain nuclear reactors for the United States Navy, I will not describe that program today; that will be addressed separately.)

The funding request for the Office of Nuclear Energy is outlined in the following table:

Budget Authority

($ in Millions)

Program Element	FY 1996 Request
Energy Supply R&D	
Light Water Reactors	49.7
Advanced Reactor R&D	0.0
Space Reactor Power Systems	0.0
Advanced Radioisotope Power Systems	49.2
Facilities	0.0
Nuclear Technology R&D	37.3
Program Direction	13.0
Policy and Management	10.2
Test Reactor Area Hot Cells	1.4
Oak Ridge Landlord	18.7
Test Reactor Area Landlord	4.0
Advanced Test Reactor Fusion Irradiations	2.3
University Nuclear Science and Reactor Support	6.1
SUBTOTAL	**191.9**
Termination Costs	81.7
Soviet-Designed Reactor Safety	78.8
Russian Replacement Power Initiative	5.0
Isotope Support	25.4
SUBTOTAL	**382.8**
Uranium Program	42.3
Total Nuclear Energy Budget Request	**425.1**

The programs proposed for the Office of Nuclear Energy in Fiscal Year 1996 not only serve a variety of important international needs, they also successfully maintain this Nation's core expertise in nuclear engineering and technology. I will now provide the Committee with details concerning the importance of our programs and the value they provide to the people of this country.

LIGHT WATER REACTORS

The overall objective of our Light Water Reactor program is to assure the availability of safe, economical nuclear energy to help satisfy the Nation's electric energy requirements. This objective is being accomplished through several program elements designed to achieve improved, standardized, and certified Advanced Light Water Reactor (ALWR) designs, as well as prolonged, safe and reliable operation of currently operating reactors.

Advanced Light Water Reactors

Under cooperative cost-shared programs with the nuclear industry, four Advanced Light Water Reactor plant designs currently are in the process of review for certification by the Nuclear Regulatory Commission (NRC). Major milestones in this program were achieved in June and July 1994, with NRC's issuance of Final Design Approval of the two large plant designs: the 1300 megawatt electric General Electric Advanced Boiling Water Reactor and 1350 megawatt electric ABB Combustion Engineering System 80+. On this basis, NRC is expected to initiate the certification rule making process early in 1995, and we anticipate design certification of these two plant designs by the end of 1995 or early 1996.

The two smaller plant designs, the 600 megawatt electric Westinghouse AP-600 and General Electric Simplified Boiling Water Reactor (SBWR), have been submitted for initial NRC review. These designs are characterized by the use of passive safety systems and simplifications that are facilitated by their smaller size. The improvements include extensive use of modularization and prefabrication, which offers the prospect of enhanced safety and reliability, and significantly reduced construction time and cost.

Extensive testing of the principal passive systems and design features for both of these smaller plant designs is in progress to confirm operation and performance and to validate the computer codes used to predict plant performance. Many European and Asian countries participate in design and testing activities for both programs. For the Westinghouse AP-600 design, the testing is substantially completed, and NRC reviews of the safety analysis and testing reports are in progress. Based on these activities, we expect NRC Final Design Approval of the AP-600 by the end of 1996 and certification about one year later. However, some of the SBWR activities are delayed but Final Design Approval is expected by 1998.

In accordance with the Energy Policy Act of 1992, we are conducting a cost-shared program with the nuclear industry to perform the detailed design of selected Advanced Light Water Reactors beyond the level of detail required for certification, in order to encourage commercial standardization and to produce reliable, firm plant cost estimates and construction schedules. The Advanced Reactor Corporation, an association of the electric utility industry chosen by the Department to plan and manage the program, selected two designs: the General Electric Advanced Boiling Water Reactor and the Westinghouse AP-600. Departmental funding will total $100 million and industry funding (including both the Advanced Reactor Corporation utilities and the vendors) will amount to about $170 million.

Detailed design activities were initiated in March 1993, and will be completed in 1996 for the Advanced Boiling Water Reactor, and one to two years later for the AP-600. Extension of the AP-600 schedule results from the extended schedule for design certification, which must be completed before the First-of-a-Kind Engineering program to assure that the design is consistent with NRC requirements.

Significant progress is being made on both designs. As of early 1995, we estimate that 25 to 30 percent of the detailed design activity is complete. For FY 1996, $26.8 million of DOE funding will support this program. This funding will be matched by the industry. The FY 1996 work will include the development of systems designs, process drawings, structural designs, plant arrangements, component specifications, plant construction plans and schedules, capital cost estimates, and other substantial design information.

Our Advanced Reactor Severe Accident program supports the Advanced Light Water Reactor certifications by making specialized expertise available at the national laboratories to evaluate severe accidents and by transferring this expertise to the reactor vendors. The program applies methods and technologies developed in DOE, NRC, and international severe accident research programs to ensure that the Advanced Light Water Reactor program has access to the most up-to-date safety technology available anywhere.

In addition to cost-sharing the Advanced Light Water program activities, the electric utility industry, through the Electric Power Research Institute (EPRI), has developed an extensive compendium of overall and specific design requirements, criteria, and guidelines. This Requirements Document has been reviewed by the NRC and is being used as a basis for developing the advanced reactor designs.

The nuclear industry, through the Nuclear Energy Institute, also adopted a Strategic Plan for Building New Nuclear Energy Plants that has been coordinated with the Advanced Light Water Reactor program. This plan, which is issued annually, outlines the building blocks being implemented to address technical and institutional issues in which significant progress is needed to make nuclear energy an attractive future option.

Existing Plant License Renewal

Currently operating light water reactors in the United States provide a generating capacity of about 100 gigawatts. Early in the next century, the existing operating licenses of a large number of these plants will expire unless extended. Our projections indicate that up to 66 gigawatts of power would be supplied by nuclear plants whose licenses could be renewed. Today's technology can facilitate the continued safe and reliable operation of many of these plants for up to 20 years beyond the period of their current licenses. To realize this potential, we, with utility industry co-funding and in cooperation with the NRC, are developing methods for implementing the NRC license renewal process.

The present license renewal rule process is being refined, and a modified rule has been issued by the NRC. Generic reports and specific information on key technical issues are being prepared and reviewed. Effort is being directed toward resolution of these issues for the different vendor plant designs, including the evaluation of components subject to age-related degradation.

Funding in FY 1996 will be directed toward interaction with the NRC on the generic technical industry reports needed to justify extended operation of long-lived passive components. Preparation of technical information on other key issues such as reactor vessel internal stress corrosion cracking, vessel annealing, cable aging degradation, adequacy of fatigue margins, and instrumentation and control (I&C) upgrades will also be pursued. In cooperation with EPRI, effort will be directed toward resolution of technical issues that relate to generic material issues associated with different vendor designs, including more specific plant screening approaches and evaluation of common components that may impact plant performance and safety.

The nuclear industry, through the Nuclear Energy Institute, has a second strategic plan that deals with improving the economic performance of current reactors. It also provides strong guidance to development efforts directed toward plant design, operation, or lifetime improvement.

INTERNATIONAL ACTIVITIES

The Office of Nuclear Energy manages programs designed to reduce the national security and environmental threat posed by the operation of aging nuclear facilities in the former Soviet Union and Central and Eastern Europe, and to promote nuclear safety worldwide. We also provide technical leadership, expertise, and coordination related to these areas to international organizations such as the International Atomic Energy Agency and the Nuclear Energy Agency, and to other countries, such as Japan, through bilateral arrangements.

Substantial concern exists over the continued operation of Soviet-designed reactors that do not meet western standards of safe design, manufacture or operation. One of our programs is aimed at strengthening the safety culture and improving the operation and physical condition of nuclear energy plants in countries that operate these reactors. Funding through the end of FY 1995 is provided through the Agency for International Development. Funding thereafter is requested for the Department of Energy; this change is reflected in our FY 1996 budget request.

The program focuses on five elements that are critical to achieving lasting improvements in nuclear safety culture and infrastructure. First, the program works to improve the capabilities of nuclear energy plant operators, to establish sound operational procedures, and to develop methods for responding to abnormalities. Specific projects include training courses, development of Emergency Operating Instructions, and provision of simulators and other training hardware.

Second, the program seeks to improve the physical condition of the plants, particularly their safety systems. Where hardware improvements are needed, upgrades are initially done on a demonstration plant, while simultaneously training and transfer of manufacturing capability are conducted. Specific projects include upgrading fire safety systems and systems for preventing radiation leaks.

Third, the program provides professionals involved in the design, operation, and regulation of nuclear energy plants with the techniques and expertise required to conduct safety analyses consistent with Western practices and, thus, make sound decisions regarding the safety, upgrading, and continued operation or shutdown of the plants. Projects include providing hardware, software, and training to conduct risk assessments and safety analyses.

Fourth, the program provides technical support for identifying and resolving safety issues related to the interim storage of spent fuel at nuclear energy plants.

Fifth, the program assists recipient countries in (a) developing the domestic liability legislation needed to allow broader involvement of the western private sector and (b) establishing a strong, independent regulatory authority. The Department assures that the regulator is involved in the early stages of each project.

In addition to the 66 operating civilian nuclear energy plants in the region, Russia continues to operate three reactors which produce weapons-grade plutonium. We are working with other U.S. government agencies in implementing the U.S.-Russia agreement on the shutdown of these reactors and a cessation of the use of newly produced plutonium for nuclear weapons.

In particular, we provide technical leadership in identifying replacement options for the heat and electricity produced by these reactors. Feasibility studies, supported by the Trade and Development Agency, will soon be underway on fossil replacement power alternatives. We are also examining the possibility of converting the fuel in these reactors so that they would operate without producing weapons-grade plutonium. Final shutdown will require identification of substantial funding, as well as a solution to the social and economic dislocation shutdown would cause.

In a similar vein, we provide technical leadership in the effort to shut down the Chernobyl nuclear energy plant. The program is aimed at developing pilot projects that will demonstrate to Ukraine that viable replacement power options exist. It also supports efforts to ensure the safe interim operation of the power plant and address the problems of decommissioning and waste management, including storage of spent fuel.

Finally, the Office of Nuclear Energy provides policy and technical leadership in many international organizations concerned with nuclear safety, nonproliferation, and nuclear technology. We conduct cooperative research and development with other countries with advanced nuclear programs, such as Japan and the United Kingdom, in the areas of nuclear safety and facility decommissioning. We also support efforts to bring improved technology and safety practices to countries such as China and India.

ISOTOPE PRODUCTION AND DISTRIBUTION

Through the Isotope Production and Distribution program, we provide radioactive and stable isotope products and associated services to a widely varied domestic and international market. These products and services are used for research, development, biomedical, and industrial applications.

Our program was recently restructured, as reflected in the National Isotope Strategy and the FY 1995 Energy and Water Development Appropriations Act. The program now operates with a revolving fund and maintains financial continuity through its revenues and annual appropriated funding. The Isotope program operates as a business and, therefore, focuses attention on the quality of products and services, customer satisfaction, cost control, marketing, pricing stability, and revenue and cash collections. We have reorganized this program around three functions: business, operations, and marketing. Federal managers are now in place and responsible for conduct of these functions.

The National Isotope Strategy establishes two primary missions. The first is to produce and distribute certain isotopes for research and development, medical diagnostics and therapy, and other applications that are needed to meet the national interest or support our health care system. Charges for these isotopes are intended to provide reasonable compensation to the Department while encouraging the beneficial use of such isotopes for research, development, and applications. The second mission is to continue to produce and distribute other isotope products and services that are in demand on a businesslike basis.

The Isotope program's biggest recent initiative is to establish a United States production capability for molybdenum-99 and related isotopes. Molybdenum-99, a precursor of technetium-99m, is the most critical of all nuclear medicine isotopes and is used in over 36,000 medical procedures each day in the United States alone. At present there is no domestic source for molybdenum-99. The United States is currently supplied by an aging reactor in Canada.

If the result of an environmental assessment currently being conducted is positive, initial molybdenum-99 production should occur by late spring 1996, and Federal Drug Administration approval could be granted by fall 1996. After an independent review, the Annular Core Research Reactor and associated facilities located at Sandia National Laboratory in New Mexico were found to be appropriate for domestic molybdenum-99 production.

A second important initiative, started in FY 1995 and scheduled to continue through FY 1996, is the operation of the calutrons at Oak Ridge National Laboratory in Tennessee to produce electromagnetically separated isotopes. The calutrons are now operating and producing several stable isotopes used in medical applications.

We continue to evaluate opportunities for the private sector to co-fund or invest in new ventures. Also, we will seek to divest ourselves from ventures that can be operated profitably by the private sector. We are committed to maintaining a strong organizational and financial basis for ensuring a reliable supply of both radioactive and stable isotopes for the United States.

NUCLEAR TECHNOLOGY RESEARCH AND DEVELOPMENT

Consistent with Congressional appropriations for FY 1995, the Actinide Recycle/Integral Fast Reactor program was terminated and permanent shutdown of the Experimental Breeder Reactor-II (EBR-II) was initiated in October 1994. The Advanced Liquid Metal Reactor design effort is also being closed out. I will address these termination and shutdown activities later in my testimony regarding the Termination Costs account.

Based on Congressional direction to our reprogramming proposal, the Department has established technology programs to be conducted at Argonne National Laboratory that redirect the valuable nuclear research and development personnel and facilities of the Laboratory toward higher priority missions. The programs will be conducted under a new budget account, Nuclear Technology Research and Development. These technology development programs include spent fuel treatment, reactor and fuel cycle safety, and decontamination and decommissioning.

At this time, the National Academy of Sciences is performing a study to evaluate the use of electrometallurgical technology, developed by Argonne National Laboratory, as a means of treating DOE spent fuels for long-term storage and eventual disposition. The potential advantage of using this technology is that it may provide for a single treatment methodology to deal with as many as 150 different spent fuel types currently in storage by the Department. The scope and funding required for this portion of the technology development effort will depend on results of this study. Let me state clearly that unless the Academy finds that this technology is appropriate and advantageous to the treatment of the Department's spent nuclear fuel, the Department will terminate the program. The funds placed in the FY 1996 budget request to support this activity are a placeholder pending the results of the Academy's investigation.

The National Academy of Sciences will provide preliminary results from this study within a month, and a final report in June 1995. We will keep all cognizant Congressional committees informed about the results of the Academy's evaluation.

Activities at Argonne National Laboratory in the area of reactor and fuel cycle safety include establishing cooperative programs with other countries to improve nuclear safety. Major tasks include development of research and development collaborations in safety technology; development of a nuclear safety data base; and performance of analyses using state-of-the-art codes, plant models, and safety technology. This program will initiate collaborative activities with U.S. utilities, the Nuclear Regulatory Commission, and others to further enhance the safety of U.S. nuclear energy plants and fuel cycle facilities. The program also will provide needed assistance to utilities dealing with the on-site storage of spent nuclear fuel.

Decontamination technology developed as a result of work related to the shutdown of the Experimental Breeder Reactor II will be made available for transfer to other facilities, including other DOE facilities, U.S. commercial facilities, and overseas nuclear plants.

UNIVERSITY NUCLEAR SCIENCE AND REACTOR SUPPORT

The Department's University Reactor Assistance programs were transferred from the Office of Science Education and Technical Information to our Office in FY 1995. The Department felt that the activities covered by these programs would be more appropriately managed by this office. A new Decision Unit was created to address this work, and the more encompassing title, "University Nuclear Science and Reactor Support," was assigned to it. The Department will continue to provide significant assistance to universities engaged in nuclear science research and training, and we look forward to working with the university community in this regard.

We will continue in FY 1996 to supply fresh fuel to, and transport spent fuel from, universities requiring such assistance. In addition, we will continue converting university reactors from using highly enriched uranium to low-enriched uranium. We also plan to support university reactor safety maintenance.

We have requested $6.13 million for this program in FY 1996, an increase of $2.4 million over the FY 1995 funding level. This increase will provide funds for the acceleration of conversion of university reactors from highly enriched uranium to low-enriched uranium, university reactor safety maintenance activities, and fellowships for students.

We plan a new educational initiative in FY 1996. We intend to provide fellowships for about 30 outstanding and promising U.S. Masters of Science and Doctor of Philosophy students to ensure that the country will have adequately trained personnel to enter into the nuclear industry, government or university community.

We will continue to be a partner with private industry in funding university nuclear engineering programs. This is accomplished by providing research grants to universities which have received similar commitments from private industry. We intend to provide funding roughly equal to the amount contributed by private organizations, but not to exceed $50,000 per university per Department grant.

Many students and faculty will continue to benefit in FY 1996 through the Reactor Sharing program. This program allows students and faculty to become familiar with the specific activities conducted at university research reactors, as well as allowing them the opportunity to use the reactor for research.

TERMINATION OF LOW-PRIORITY PROGRAMS

The Termination Costs budget request of $81.7 million provides for the shutdown of unneeded nuclear facilities and termination of the Modular High Temperature Gas Reactor program.

In October 1994, permanent shutdown of the Experimental Breeder Reactor-II (EBR-II) and other unneeded facilities at Argonne National Laboratory-West was initiated. The shutdown, approximately a five-year effort, is directed at placing the facilities into an industrially and radiologically safe shutdown condition for transfer to the Office of Environmental Restoration and Waste Management. The major facilities to be shut down at Argonne National Laboratory-West are the EBR-II, the Fuel Manufacturing Facility, and the Transient Reactor Test Facility. The EBR-II shutdown activities include removal of the blanket and fuel subassemblies; treatment of the blankets and driver fuel in the Fuel Cycle Facility, resulting in a form suitable for storage; and removal and processing of the sodium.

The Consolidated Fuel Reprocessing Facility and the Tower Shielding Facility at the Oak Ridge National Laboratory will be transferred to the Office of Environmental Management at the end of FY 1996.

The Idaho Brain Tumor Center in Idaho Falls has a lease on the Power Burst Facility at the Idaho National Engineering Laboratory and has retained a nuclear architect-engineering firm to review the technical and economic feasibility of converting the Power Burst Facility Reactor for human boron neutron capture therapy cancer treatments. The Department will continue to pay the surveillance and maintenance costs until the Idaho Brain Tumor Center takes possession of the Power Burst Facility. If the Center does not take possession of the facility in FY 1996, surveillance and maintenance costs will be funded by the Office of Environmental Management.

Boron neutron capture therapy treatments are currently being performed at the Brookhaven Medical Research Reactor, an Office of Energy Research reactor which the office of Nuclear Energy operates. So far there have been two patients treated. Twenty-seven additional treatments are anticipated by the end of 1995.

Shutdown of operations at the Energy Technology Engineering Center that were sponsored by the Office of Nuclear Energy was completed in FY 1994. The Department is attempting to find other users for the Center, and interactions with interested organizations are continuing toward establishing financial and program arrangements. In FY 1996, the Office of Energy Efficiency and Renewable Energy will assume management and funding responsibility for the Energy Technology Engineering Center.

TEST REACTOR AREA HOT CELLS

In FY 1996, we will continue to operate and maintain the Test Reactor Area Hot Cells at the Idaho National Engineering Laboratory (INEL), which support isotope production in the Advanced Test Reactor for medical and industrial applications.

TEST REACTOR AREA LANDLORD

In FY 1995, we assumed landlord funding responsibilities for the Idaho Test Reactor Area (TRA). The TRA Landlord function was previously funded by the Office of Environmental Restoration and Waste Management. The TRA facilities are used to perform program work for Naval Reactors, the isotope program, and various other DOE programs.

Landlord activities in FY 1996 will include general facility and utility maintenance and repair, operating support, General Plant Projects, and detailed design of a major line item construction project to upgrade fire and life safety at the TRA. The Fire and Life Safety Project will ultimately cost $15.5 million and will take until the end of FY 1999 to complete. The corrections to be provided will bring the systems and facilities into compliance with the new fire and life safety requirements of the DOE regulations and national codes and standards.

ADVANCED TEST REACTOR FUSION IRRADIATIONS

Our budget request includes $2.3 million for the conduct of fusion program experiments in support of the DOE/Monbusho and Beatrix-II programs. This experimental program was originally planned to be conducted in the Fast Flux Test Facility (FFTF) and, later, the EBR-II. With the shutdown of the FFTF and EBR-II, the Advanced Test Reactor (ATR) at INEL was selected to conduct the irradiation program. We plan to complete design, fabrication, and installation of a test vehicle in the ATR for the Fusion Materials Irradiation Test program by the end of FY 1996, and to be fully ready to commence irradiation testing in FY 1997.

The primary focus of the initial irradiation program will be to test advanced materials components in the fusion system's first wall. The first series of irradiation tests, scheduled for completion in March 1999, will complete the program that was underway at the time of the FFTF shutdown, which was a collaborative effort with Monbusho of Japan. Further fusion program testing in the ATR after March 1999 is also envisioned.

OAK RIDGE LANDLORD

Oak Ridge Landlord funding is centralized in the Office of Nuclear Energy. This activity provides for Oak Ridge Operations infrastructure requirements and general operating costs. These activities are not attributable to any one particular program, but instead support all programmatic missions.

Activities funded in this account include environmental, safety, and health upgrades of the water plant that provides potable water for the Y-12 plant, Oak Ridge National Laboratory, and the City of Oak Ridge and maintenance of the Oak Ridge Reservation's roads and grounds (22 miles of paved roads and associated rights-of-way, 32 cemeteries, and four bridges). Other activities funded under this category include operation of the emergency operations center, which is responsible for emergency management at Oak Ridge and is required by Departmental orders and federal laws and regulations; physical security activities, including protective forces for the Oak Ridge facilities and administrative areas; and payment in lieu of taxes to the local community (this program is being reinstituted, effective 10/1/95).

Operation of the Museum of Science and Energy is also partially funded through this account. The museum annually hosts an average of 200,000 visitors and is a principal facility that supports the Department's mission of informing the public about its programs.

SPACE AND DEFENSE POWER SYSTEMS

The purpose of the Space and Defense Power Systems program is to produce radioisotope power systems for U.S. civilian space missions and national security terrestrial missions. Radioisotope power systems have been in use for three decades and are proven, reliable, and maintenance-free power supplies that are capable of producing up to several kilowatts of electricity for tens of years. We are requesting funding of $49.2 million for this program in FY 1996.

Radioisotope power systems are the cornerstone of the Nation's space nuclear energy program, which requires low levels of electric power. These power supplies enabled the Galileo spacecraft to transmit pictures of Gaspra, the first, up-close pictures of an asteroid ever taken. As it neared Jupiter, this same spacecraft was also in a position to take some direct line-of-sight pictures of the Levy-Shoemaker comet as it impacted Jupiter. Radioisotope Thermoelectric Generators are also powering the Ulysses spacecraft on its voyage to the polar regions of the Sun. The first encounter with the polar regions will occur later this year.

The current program emphasis is on providing three new Radioisotope Thermoelectric Generators and up to 157 Radioisotope Heater Units to support the NASA Cassini mission planned for launch in October 1997. In addition, the program provides support for terrestrial Radioisotope Thermoelectric Generator applications for national security missions. Major program efforts include basic support for radioisotope fuel and heat source development, fabrication, quality testing, and flight qualification. The program efforts also include nuclear safety analysis and testing; development of the power converter subsystem; and all aspects of manufacturing, quality assurance, reliability, and operational safety for radioisotope power systems.

Radioisotope Thermoelectric Generators

Work in FY 1996 will continue to focus primarily on the fabrication of components and Radioisotope Thermoelectric Generators (RTGs) for the Cassini mission. Processing of Pu-238 fuel for Cassini should be completed within the next few months at Savannah River, after which recycled material will be processed into a usable oxide powder form for future use. The iridium clad vent set fabrication work at Oak Ridge has essentially been completed; vital capabilities are being sustained and facilities maintained in order to support future missions. Efforts at the Los Alamos National Laboratory are continuing to fabricate the Pu-238 fuel pellets and encapsulate them into the iridium cups. Production of flight-quality fuel clads for Cassini should be completed during FY 1996; Los Alamos National Laboratory (LANL) will then be maintained with capabilities intact for future mission support. The Mound Facility operations will continue during FY 1996 to support Cassini with the assembly of the General Purpose Heat Source modules and the heat sources into the generators that are fabricated by a private contractor, Martin Marietta Energy Systems, Inc.

The first newly fabricated flight Radioisotope Thermoelectric Generator should be fully assembled, tested, certified for flight, and placed in controlled storage during FY 1996.

Fabrication of thermoelectric converters will continue during FY 1996, with the final unit delivered by the end of the fiscal year. Safety analysis studies are continuing in support of the Cassini mission and will continue throughout FY 1996. The Preliminary Safety Analysis Report used to initiate the formal safety review of the General Purpose Heat Source-RTG Cassini mission application was issued in December 1994. The Final Safety Analysis Report will be finished in early FY 1997.

NASA has requested that we initiate the development of a smaller Radioisotope Thermoelectric Generator unit for use in future Pluto and other outer planet missions. However, budget constraints preclude the Department from undertaking this effort at this time. The Department has met with NASA and informed them that future development efforts must be funded by the user. DOE will maintain the required facility infrastructure that will allow Radioisotope Thermoelectric Generators to be fabricated for future missions, but will rely on the users to fund the actual development efforts. Therefore, the budget request does not include funding for future, mission-specific development efforts.

Plutonium-238 Acquisition and Processing

Plutonium-238 for the Cassini mission is being taken from the existing inventory and is being processed at the Savannah River facilities. A key issue in the future use of Radioisotope Thermoelectric Generators is ensuring an adequate supply of plutonium-238 (Pu-238). Due to the planned shutdown of the Savannah River facilities used to process Pu-238 into usable, specification-grade oxide powder, another long-term source of Pu-238 needs to be identified. In the near term, the Department has contracted to purchase up to 40 kgs of Pu-238 from Russia by 1997. Approximately 10 kgs have been delivered; however, funding is not included in FY 1996 for any additional purchases.

Special Applications

Our Special Applications program continues to develop and demonstrate technologies and refurbish existing power supplies in fulfillment of its obligation to provide Radioisotope Thermoelectric Generators for terrestrial national defense missions. We will continue to provide refurbishment and production services for high-performance generators for the Department of Defense.

URANIUM PROGRAM

The uranium program is focused on furthering arms control and nonproliferation goals, and on improving industrial competitiveness. First, the Office of Nuclear Energy is leading an effort to assure that Russian low enriched uranium being purchased by the United States Enrichment Corporation (USEC) is actually derived from highly enriched uranium removed from Russian weapons. Secondly, the Energy Policy Act of 1992 requires the DOE to continue certain responsibilities for the gaseous diffusion plants it has leased to the United States Enrichment Corporation (USEC). Finally, we are forming partnerships with U.S. industry to capitalize on the multi-billion dollar investment made by the Department in uranium enrichment technologies that can now be used in other applications. This technology transfer effort offers a great potential for a wide variety of businesses.

Transparency Measures

The Office of Nuclear Energy has the Departmental lead in implementing the Government's international arms control and nonproliferation objectives for the USEC contract to purchase 15,000 metric tons of Russian low enriched uranium derived from highly enriched uranium. DOE personnel are overseeing activities to help build confidence that the material delivered to the USEC has been derived from Russian highly enriched uranium. While the Protocol on Further Arrangements cleared the way for deliveries of Russian enriched uranium to USEC, the United States is continuing to negotiate the detailed monitoring procedures.

The Protocol on Further Arrangements calls for both special monitoring visits to facilities where material will be processed, as well as, the establishment of permanent offices at a facility in each country to oversee the implementation. The actual number of special monitoring inspections is subject to negotiation. The number of inspections will be supplemented by an unlimited number of visits by staffs of the permanent offices to the facilities where those offices are located.

The permanent U.S. office will be located at the Ural Electrochemical Integrated Enterprise (UEIE) plant located at Novouralsk. The UEIE plant is the site where highly enriched uranium (HEU) oxide will be converted into low enriched uranium for delivery to the United States. Special monitoring visits will also be conducted at the Siberian Chemical Enterprise near Tomsk, Russia, where HEU metal is converted to oxide. The combination of the continuous presence and the periodic inspections is expected to provide a sufficient degree of confidence that the LEU being delivered to the United States is derived from HEU. Further, under the protocol, the Russian Federation also has the right to monitor the additional processing of any enriched uranium derived from Russian highly enriched uranium at facilities in the United States.

Activities Related to the U.S. Enrichment Corporation

As a result of the Energy Policy Act of 1992, the Department and USEC are bound together by a series of provisions that require interdependent activities in many areas. These areas include regulatory oversight, lease management, site operations, and pre-existing liabilities at the Department's gaseous diffusion plants now leased by the Corporation, as well as for revitalization of our domestic uranium industry. By July 1, 1995, the USEC must submit to the President and Congress a plan that outlines how privatization will allow for maximization of the long-term value of the Enrichment Corporation. The Department will need to continue to play a leading role in this activity, including remaining as the owner of the gaseous diffusion plants. Approximately $70 million of the FY 1996 budget request for Uranium programs is tied to fulfilling DOE's responsibilities as defined by the Energy Policy Act.

Regulatory Oversight

The Office of Nuclear Energy has the responsibility for nuclear safety regulatory oversight of the gaseous diffusion plants. DOE and the USEC are working together to ensure the continued safe, efficient operation of these plants. The Energy Policy Act named the Nuclear Regulatory Commission (NRC) as the regulatory authority for the plants. However, NRC certification of the plants will be based on a Compliance Plan being prepared by DOE and a License Application being prepared by USEC. The NRC is expected to certify the plants or approve the Compliance Plan by October 1995. In accordance with the Energy Policy Act, DOE remains responsible for nuclear safety upgrades at the plants, as delineated in the Compliance Plan to meet initial NRC standards. These upgrades are estimated to cost between $80 and $120 million and take between three and five years to complete. Costs of the upgrades will be paid primarily through the transfer or sale of excess Departmental inventories of natural and low-enriched uranium derived from highly enriched uranium, as stipulated in an agreement with USEC.

Lease Management

The Department and the USEC entered into a six-year lease that sets forth the conditions under which the USEC operates the enrichment plants. As provided in the lease, the USEC, with a two-year notice, can terminate the lease for one or both of the enrichment plants. The Department is beginning to plan for the safe and orderly return of the enrichment plants for decontamination and decommissioning.

Uranium Revitalization

To meet the Department's responsibility to support the domestic uranium industry, we have implemented a Uranium Revitalization program since 1993 and reported annually to Congress on our progress. The revitalization activities to date are focused on four main areas: (1) working with stakeholders through an outreach program; (2) encouraging state regulators to allow flexibility in fuel purchase guidelines to promote the purchase of domestic uranium; (3) encouraging export opportunities through cooperative efforts with the Departments of State and Commerce and others; and (4) prudently selling off the government's excess natural and low-enriched uranium inventories to reduce the Department's budget request while taking into consideration the concerns of the domestic uranium industry.

The Department is also required to submit to Congress a comprehensive report on the government's uranium inventories and an assessment of the potential to use excess material for commercial sales. The Interim Uranium Inventory Report, submitted to Congress in September 1993, found that the Department's inventories of natural and highly enriched uranium may have significant value if sold for use in the commercial nuclear fuel cycle. The Department anticipates selling or transferring to the USEC at least $400 million of excess uranium over the next five years.

Site Operations

Site operations include environmental corrective actions, management of the depleted uranium inventories, shutdown of highly enriched uranium production facilities, and maintenance of facilities not leased by the USEC. We are working at the gaseous diffusion plants to complete environmental corrective actions necessitated by operations prior to the USEC transition date and at facilities not leased to USEC.

Responsibility for managing the Department's depleted UF_6 inventories at the enrichment plant sites also lies with our office. Over 560,000 metric tons of this material are safely stored at the sites, awaiting final disposition. An Advance Notice of Intent and a request for technology recommendations for the final disposition and uses of the UF_6 have been published in the Federal Register. Work has begun on developing an environmental impact statement that will explore all of the alternatives and recommend the best course of action for the eventual disposal of this material.

The shutdown of the Department's highly enriched uranium production facilities at Portsmouth is scheduled for completion in FY 1995. To date, 100 of the 200 highly enriched uranium equipment cells have been treated to remove excess uranium deposits. When this process is complete and highly enriched uranium inventories have been removed from the site or blended to low-enriched uranium, security at the facilities will be downgraded, resulting in significant budget savings.

Over 70 facilities at the plant sites were not leased by USEC and remain the responsibility of the Department. As landlord for the sites, we continue to maintain these facilities and their associated permits.

Pre-existing Liabilities

The Office of Nuclear Energy is also responsible for satisfying financial obligations associated with enrichment operations before the transition to the USEC. Chief among these obligations are payments of post-retirement life and health benefits to the Department's enrichment plant operating and power supply contractors.

In addition, DOE is responsible for assisting in the litigation of numerous lawsuits involving claims against the Department for its operations at the enrichment plants prior to the transition date.

Technology Transfer

The Department has the responsibility for identifying non-uranium enrichment applications for gaseous diffusion and gas centrifuge technology and for transferring the Atomic Vapor Laser Isotope Separation (AVLIS) technology to the USEC. Numerous industries have expressed interest in commercializing gaseous diffusion and centrifuge technologies for applications other than enriching uranium. We are engaged in efforts to gain private sector involvement in developing future uses of these technologies.

Possible industrial applications include waste stream and gas refinery cleanup, beverage and blood clarification, and gas and liquid separations. We expect to execute a minimum of four Cooperative Research and Development Agreements in FY 1995 and as many as six to eight more in FY 1996.

We will continue to seek and evaluate additional opportunities for the commercial advancement of these technologies. We are also negotiating an agreement that will allow the AVLIS process to be used by USEC. In addition, we are discussing with USEC possible options on how best to implement the transfer of other related technologies.

CONCLUSION

Ensuring nuclear energy's role as an energy option for the nation's future and promoting global nuclear safety are the cornerstones of the Office of Nuclear Energy's programs. Through our efforts in civilian reactor development, national security, international nuclear safety, isotope production, and other activities, we will continue to achieve the promise of nuclear energy.

U.S. Department of Energy
Office of the Secretary
Washington, D.C. 20585
202/586-5534

BIOGRAPHY

RAY A. HUNTER

Mr. Ray A. Hunter is the Acting Deputy Director of the Office of Nuclear Energy in the U.S. Department of Energy (DOE). He was appointed Acting Deputy Director on September 1, 1994.

As the Acting Deputy Director of Nuclear Energy, Mr. Hunter is the Deputy to the senior manager for all of the Office's programs. The Office is responsible for the development of safer nuclear power plants, Advanced Light Water Reactors; providing nuclear safety assistance to countries with Soviet-designed reactors; producing and distributing radioactive isotopes for medical and industrial uses; and developing advanced nuclear power systems for civilian and defense space missions. In addition, the Office oversees the Naval nuclear propulsion research and development program; the operation of DOE test and research reactors; and uranium program activities retained by the Department.

Mr. Hunter also serves as the Director, Facilities Division, within the Office of Nuclear Energy. As Director, Mr. Hunter is responsible for operational and safety management for the Advanced Test Reactor and related facilities at the Idaho National Engineering Laboratory; the High Flux Isotope Reactor at Oak Ridge, Tennessee; and the High Flux Beam Reactor and Brookhaven Medical Research Reactor at Brookhaven, New York. Mr. Hunter is also responsible for the management of the safe shutdown of surplus facilities at the Argonne National Laboratory-West site, including the Experimental Breeder Reactor-II, and the shutdown of the Fast Flux Test Facility at Richland, Washington.

Prior to joining the Atomic Energy Commission in 1968, Mr. Hunter was employed in private industry in the field of sodium technology. His responsibilities included operational evaluations of the Enrico Fermi Atomic Power Plant, the nation's first commercial liquid metal fast breeder reactor.

Mr. Hunter holds B.S. and M.S. degrees in Chemical Engineering from Wayne State University in Detroit, Michigan, where he also served as an instructor in the Chemical Engineering Department. He and his wife Nancy have two children, Michael and David.

March 1995

TUESDAY, JANUARY 31, 1995.

THE FUTURE OF THE DEPARTMENT OF ENERGY

WITNESSES

DR. EDWARD TELLER, LAWRENCE LIVERMORE NATIONAL LABORATORIES

DR. WILLIAM HAPPER, DEPARTMENT OF PHYSICS

DR. FREDERICK M. BERNTHAL, PRESIDENT, UNIVERSITIES RESEARCH ASSOCIATION, INC.

JOHN T. CONWAY, CHAIRMAN, DEFENSE NUCLEAR FACILITIES SAFETY BOARD

Mr. MYERS. The committee will come to order.

I appreciate each of you coming today to participate in, I don't want to call it oversight, kind of an overview. There have been a lot of suggestions as we come along about possible changes in the Department of Energy. Nothing new about that. Ever since its inception a few years ago there has been some criticism, but I think each of us are concerned about the role of the Department of Energy, particularly the Department of Energy, and what we might do to work together to make it more effective to do the job that we so vitally need. I appreciate so much each of the people today who will be witnesses here.

We are heading off with Mr. Atomic Energy himself. I suppose if you were to characterize nuclear energy, our nuclear weapons systems, and characterize it by one person, it would be affectionately called Eddie Teller. Dr. Teller, who all of us know has been one of the leading advocates of our nuclear weapons systems, is a physicist who chose the United States to be his home, and made a great big contribution, not only for our country, but for the world. To talk about nuclear energy, we thought of no one better to have the advice and counsel than Dr. Teller.

So I appreciate, and the committee appreciates very much you taking the time this afternoon to share with us your thoughts about what we might do to make the department more effective; and what might we expect based on your vision, your great knowledge and experience for the future.

So, Dr. Teller, it is all yours. Thank you very much. You might want to drop the microphone just a bit. Thank you.

OPENING STATEMENT OF DR. EDWARD TELLER

Dr. TELLER. Thank you very much. It is a real great privilege to be here. Nothing would have kept me. I have submitted a somewhat detailed statement which I do not want to repeat.

Mr. MYERS. Dr. Teller, that will become a complete record. And whatever you say today will also be added to that record, so we appreciate it.

Dr. TELLER. Thank you.

I have a brief addition, which I have submitted just a few minutes ago, which I do not recommend. An addition which says if there is a big change, then that will need very careful and long consideration. And then if there is a big change, it should be in the direction of the great enterprise of establishing what some people have called a Department of Science and Technology. I refer to it as Department of Research. Not to take the place of the research activities that are occurring now in the various departments, DOE, DOD, NASA, NIH, other places, but to provide for research to push by the special departments more in the direction of the pull.

This kind of dual approach is difficult but might have advantages; and the one advantage I see is that today there is a general movement, a general opinion to which I will also refer later a little, a general opinion of being afraid of progress.

I think progress is the lifeblood of civilization, and very particularly of American civilization. And our fears are exaggerated. But we will not deal with them by ignoring them. One can deal with them only by acknowledging them and dealing with them, one by one, on their merit.

Now, that is essentially what I am talking about in the addition. In the body, I am talking about a number of important issues which I think are important. Those I want to repeat very briefly here from the point of view of action that you gentlemen might choose to take.

To begin with, I would like to emphasize the tremendous change that has occurred in the last few years. If you will excuse me for a personal remark, I was born in Hungary. For more than half a century, I was a nonperson, and I did not consider it wise to go back and visit. In the last couple of years, I have been there at least half a dozen times. I have been an intimate witness from the inside, from knowing the people with whom I was talking, knowing their way of thinking. What a tremendous change it is to be out from under the domination of Moscow. And I am sure that this holds not only for Hungary, it also holds for Russia itself.

Something tremendous has been accomplished by a firm policy of which defense preparedness without actually using the violence, has been a part. And because of technology, it could be accomplished at a relatively low cost. Otherwise, what perhaps mistakenly we called the Cold War, never could have been won.

I say this for a very definite purpose. We have now an opportunity for international cooperation, for real progress and stability and safety in the world, safety from the greatest of all dangers, from human aggression, from exaggerated human emotions. But this will take a lot of doing. To say that the job is done will be to throw away an opportunity which is now barely beginning.

MILITARY RESEARCH FUNDING

Now, under the present condition, I will start with the military end. Under the present condition, it has been said, and I do not contradict it although I do not know too much about it, that reduction in military budgets is justified. But one thing is not justified. It is not justified, and yet it is done, and that may lead to catastrophe.

What is not justified is reduction of military research. With the Soviet Union no longer existing, there is an opportunity for international cooperation in the new era if you handle it rightly. The role of the military will be very different. The weapons we need will be very different.

At this time, to step back from research is the biggest mistake we could make. And I claim that in many cases we are making that mistake.

Military requirements are something real, but they are not enough. They are what is immediately before our eyes. The military requirement at the moment are twofold: to check on the functioning of the effectiveness of our nuclear stockpile—I am talking about that part of the job that falls into the DOE. The second is even more important; the second is connected with proliferation.

What is not covered in a discussion of the military requirements is unforeseen. In this century, unforeseen technical developments have changed the very nature of warfare half a dozen times. Military requirements will not cover those.

The DOE laboratories, in the case of nuclear energy and in the case of electronics, in the case of unheard of accuracy, have gone far beyond and in other directions from military requirements. Big organizations are in their nature conservative.

Researchers, searchers for truth, are in their nature evolutionary. So submit them, subject them to the military requirement criteria, to try to foresee what has to be discovered, will ensure that America will lose its great advantage within a couple of decades.

The military research in the laboratory where I am spending most of my time, Livermore, has been cut in the last 10 years to half, by 50 percent, while general military expenditure have been cut to 70 percent, by 30 percent.

I would like to recommend as a very clear, positive, definite, urgent action, you provide the appropriate money for specific purposes to restore some of these cutbacks in research—particularly in the weapons laboratories of DOE, Los Alamos, Livermore and Sandia. I think that is the future-oriented path, the one that will be truly effective.

NONPROLIFERATION

Now, in one other requirement, the difficult requirement, nonproliferation, trying to ensure that something that is obviously possible and obviously important, most nations will refrain from pursuing it. We have a counter mission called SDI, Strategic Defense Initiative, which tries not to eliminate, which we cannot, the possibility of nuclear weapons; but it tries to eliminate the sudden massive catastrophic delivery.

As long as we were faced with tens of thousands of Soviet missiles, this looked like a job where we can make a little progress but never be satisfied. Today the actual danger quantitatively is reduced by a factor of hundred, because I hope that the relaxation between ourselves and the Soviet Union with the latter no longer existing, will be permanent.

Even so, we are in danger from North Korea among other places. It is the 1 percent of the danger that we were trying to defend against.

Today, the SDI proposals, using space, is a very real possibility, realizable in a short time. A little part of it in two years, most of it in five. Not something far off. Something very real. Probably not using nuclear weapons at all, but possibly using some other technology. But certainly taking hold of destroying not only short-range missiles but long-range missiles.

We have made a beginning of it in the Gulf War. We know how to do it very much better.

My second recommendation is to work out a detailed plan of doing that. And not only appropriate money for it, but appropriate money. I am not talking about an amount other than 1 or 2 percent of our military expenditures, not a tremendous program; but what is really needed for the defense of the American people and for the defense of our allies. Therefore for a worthwhile worldwide cooperation, this, I claim, should be appropriated in terms specifying in detail how the money is to be spent so that it cannot be spent otherwise and it must be spent in just this way.

Now, in order to make all this effective, I do not want the situation where the United States will appear as policemen of the world. Perhaps it would be good if anyone can fill that role, the United States can. Because we show, we have shown what we can do in the Marshall Plan, in making peace, real peace, where there has been war—the most wonderful thing that has happened in foreign policy, I think, at any time.

But even so, the American people don't want us to be the policeman of the world. Other people throughout the world don't want us to be policeman of the world. I don't think in political terms, in psychological terms, it can be done. I think it is necessary that international cooperation is found to counter the dangers of aggression.

DECLASSIFICATION OF INFORMATION

This international cooperation, on the other hand, I believe will not work unless we make a very thorough change in our policy of secrecy. If you don't know what we are talking about, we cannot cooperate. I believe that by openness we on the whole will not help the proliferator. In every case that I know of where there has been a will to acquire nuclear weapons, lack of knowledge, lack of understanding, was not the difficulty.

On the other hand, our policy of very restricted information has given rise to a public misunderstanding of what is going on. I recommend a policy of openness and, for its implementation, I recommend that some timely means be set, like not more than five years, maybe three years. Information that can be understood by the public, I don't mean blueprints, I mean general description, general plans that policymakers need to know and the people need to, must be declassified in no more than five years. And that is not enough.

The present administration has taken some worthwhile steps toward declassification. For instance, the opening up of controlled fusion research, important research, is a very good idea, the openness. On the other hand, there has been opening up of secrets that were never real secrets, of experimentation with fissionable materials.

The opening up of this has been accompanied by incredible exaggeration in the press and little or no action on the part of the Department of Energy to counteract such exaggeration. Like a correct statement that when boys, 16-years-old in Massachusetts, were given radioactive materials for research purposes, their consent was not sought. What was not mentioned in the declassification, that their parents had given consent. Incomplete declassification, declassification without explanation, misuse of the power to declassify in order to influence opinion, these are very real dangers. I think whatever you can do to ensure that in a short time, after a few years, the basic information should become public.

Longer classification needs very thorough justification. And here I don't know how to legislate or how to have budget control; but the very interest of Congress in the details of declassification, the care that has to be taken that while declassifying all sides of a declassified situation, should be presented to the public in a balanced manner. These are very important questions.

Now, I have one last point to make in a little detail, and then I would like to terminate my statement now as rapidly as I can, because I hope that having submitted my statement a week in advance and for other reasons, you might have questions and I would love to try to answer them.

CLEANUP RESEARCH

The one additional point, I have now already alluded to it, alluded to it twice, is the unnecessary fear, the unnecessary scare, the unnecessary restrictions. I want to put it in terms of a budget. We are talking about the Department of Energy. Its budget is $17 billion per year. Of this $17 billion, nearly $7 billion is spent on cleanup.

Now, I claim that very probably most of that $7 billion is unnecessary; that the number of lives that have been saved is probably less than seven, possibly less than one. There is a lot of talk about the dangers of radioactivity, and of course we know that massive exposure to radioactivity is damaging. But they never occur, practically never. The trouble lies in a different direction. There is an assumption, a plausible assumption, that 10 times less is one-tenth the damage. Thousand times less gives one thousand less damage. This has been asserted now for 50 years. All kinds of research has been performed to justify. That research has led to an ever weakening support of the statement.

More and more it seems that what we call mutations, changes at random that can be dangerous, are very common occurrences. What radiation causes is caused by a number of natural causes. In each cell of my body and yours, more than a thousand per day, there are mechanisms to control this damage. And real damage comes when the control breaks down. Under these conditions, with mutations being a natural phenomenon, common to all polycellular beings, a simple proportionality is probably wrong.

There is an excellent book by a Japanese on the health effects of low-level radiation. In this book, 25 percent of which consists of tables gathered in Hiroshima, Nagasaki, Chernobyl, many other places where there is naturally more radioactivity. In the introduction he says proportionality is a myth. My raw data do not prove, but tend in the direction that if you get three times the background radiation, it may be even good for you. That certainly is not a claim. It is a statement about the great amount of uncertainty.

I therefore recommend—and here is something which I am sure will not be easy to do—I therefore recommend not only research, strong support of research, trying to verify the need for cleanup, but I furthermore recommend that these enormous expenditures for cleanup should not have your budgetary support except in those cases where in your judgment adequate scientific proof is given.

To find this scientific proof is one of the very important jobs ahead of you; and I think it will lead not only to an abating of an unnecessary hysteria, it will be the one item that is a really big money-saver. We have tried to save money on everything, on the fight against the unnecessary scares. We have spent with our eyes blindfolded. These blindfolds must be removed by proper research.

Now, at the very end I would like to say there is a topic which I addressed in my paper to you, research. In the laboratories of DOE, research is well recognized, well done, strongly emphasized in two fields—in two fields that require accelerators, as in programs, in Brookhaven and Los Alamos, or lasers, as in the National Ignition Facility in Livermore. These research programs are in the forefront of very practical research. And I think they deserve every support.

Now, I hope I have been brief enough.

Mr. MYERS. Right on the money.

Dr. TELLER. So as to leave a little time for questions. I hope I don't need to stop, but I hope at least one question will be asked about something.

[The statement of Dr. Teller follows:]

EMBARGOED UNTIL RELEASED BY THE SUBCOMMITTEE

PREPARED INVITED TESTIMONY

ON

THE U.S. DEPARTMENT OF ENERGY

BEFORE THE

SUBCOMMITTEE ON ENERGY & WATER DEVELOPMENT
COMMITTEE ON APPROPRIATIONS
U.S. HOUSE OF REPRESENTATIVES

BY

DR. EDWARD TELLER

JANUARY 31, 1995

PUBLIC PARTICIPATION

Due to the history of atomic energy and inherited classification regulations, much of the past work of the Department of Energy has been practically inaccessible to public scrutiny. This has resulted in many misunderstandings, a situation not in harmony with the democratic process, and has given rise to numerous deficiencies.

With the ending of the Cold War, secrecy can be greatly reduced. Indeed, this fact has been recognized by our Government. On the other hand, the way to reduce secrecy effectively and rapidly and replace it by proper public understanding remains an unsolved problem. It is urgent to consider some of the details of declassification procedures. I have two suggestions.

One is that, as a general rule, technical information on a level where it can be understood by the public should not be kept secret for more than five years. Beyond that time, our form of government has rarely succeeded in keeping secrets. I believe that declassification should automatically proceed, including practically all technical facts more than five years old and general enough to be understood by the public.

There will be, of course, a few exceptions from this rule. I would like to see these exceptions limited by requiring that at least one out of a small number (maybe 100) authorized experts take explicit responsibility for keeping information classified for a period longer than five years, giving detailed reasons in writing for extended secrecy.

The second point concerning declassification is that disclosure is not enough. Appropriate public understanding needs to be stimulated in order that the particular mode of the release of information should not present a one-sided picture. I believe that the Congress could play a most important part in this process by mandating and supporting that a number of experts to look to it that the information that is being declassified is presented in a factual and understandable manner, which presentation may include explicitly conflicting viewpoints.

FOUR BRANCHES OF THE DEPARTMENT OF ENERGY

My more detailed comments are related to the four most important branches of the Department of Energy in which I am particularly interested. These are the supply of energy, the cleanup of the environment connected with the past work of the Department of Energy, military applications work, and basic research.

The budget of the Department of Energy in the cleanup is approximately seven billion dollars, while the total is seventeen billion dollars.

In the following I shall make comments on the work of these four fields, keeping in mind the impressive total of the work assigned to the Department of Energy.

THE SUPPLY OF ENERGY

It is generally recognized that the supply of energy is a world-wide problem. In the United States, the problem of supply acquired more urgency in the last quarter-century, particularly in connection with the oil embargo of 1970. The main line of approach to a solution of the domestic problem was reduction of waste in the use of energy. This, of course, is a good approach that succeeded in some measure. It is, however, not probable that this approach by itself will suffice in coming decades.

In spite of its original nuclear orientation, the Department of Energy has practically stopped all development and even all research on nuclear reactors for electricity production. It has concentrated on methods to save energy and on other energy sources including solar and wind energy, where raw materials do not constitute problems.

All of these non-nuclear prospects are important fields of research. It is, however, not clear that it is research best performed by the Government. Indeed, the present trends may be due to a considerable extent to the desire to expand the responsibilities of the Government. It would seem to me that the Department of Energy may usefully restrict itself to the study and recommendation of procedures that will stimulate American industry. As examples I might mention regulations involving tax benefits and possibly tariffs which will appropriately stimulate the work of American private enterprise in these fields.

Nuclear electricity production is a different story. Existing government regulations and public attitudes which cannot be changed in a rapid fashion make it necessary that, if nuclear energy is not to be neglected to the National detriment, the Government must take an active role. I, therefore, recommend that research on nuclear power production should be supported in a thoughtful and selective manner in several of the National Laboratories.

It is mistakenly stated that nuclear electricity is necessarily expensive. Successful work abroad, particularly in France and Japan, proves the contrary.

The needed basic materials are at present in no short supply. Considering possibilities like the fast breeder and the utilization of Thorium, the supply could become practically inexhaustible.

The issue is safety. Indeed, the resolution of that issue is demanded by the public in an irresistible fashion. Some people demand that nuclear reactors must be absolutely safe. Such a demand cannot be fulfilled. I propose to shift the emphasis to obviously safe reactors. This means that we should not only increase safety, but do it in such a fashion that the establishment of safety can be easily understood and thus generally accepted.

The best-established advanced development track for nuclear power reactors is the fast breeder. This program does not and cannot fulfill the need for obvious safety. Its success depends on the handling of fast neutrons whose behavior cannot be changed in a flexible manner. The result is that proposed safety measures which in principle are good enough are, in practice, both expensive and anything but obvious in their operation.

In the following I shall describe a general approach which I believe will lead to a widely applicable solution of the civilian energy-supply problem.

First, the reactor should be constructed underground, below perhaps 300 feet of loose, dry earth. Experimentation with nuclear explosives under such conditions has given conclusive evidence that the energy of any conceivable nuclear reactor accident will be far too small to give rise to radioactivity appearing on the Earth's surface. Detailed work has shown that this might happen only along structures (e.g., pipes) leading down to the position of the nuclear reactor, and we know of extremely reliable safety measures sufficient to eliminate these leaks. Furthermore, the possible spreading of underground radioactivity after a catastrophic energy release has been studied and found to be sufficiently slow. Excluding nuclear reactors from the Earth's surface is an effective and easily understood safety measure.

My second proposal is to exclude human access. The few actual important reactor accidents, Three Mile Island in 1979 in Pennsylvania and Chernobyl in 1986 near Kiev, were both caused by a chain of gross human errors. I claim that reactors can be made foolproof if the access of all fools, which in practice means the access of all people, is denied. If this can be accomplished, it will be a further effective and obvious safety measure.

My third proposal is connected with the second. The reactor should function underground (as has been stated) without any moving parts. The functioning of the reactor will be regulated by energy demand. This can be done, for instance, by appropriate, modifications of General Atomic's High Temperature Gas-cooled Reactor (HTGR). This reactor runs on easily controlled slow neutrons. By introducing appropriate "poisons" that absorb neutrons at higher operating temperatures, the reactor can be given a strong "negative temperature coefficient," which means that when the reactor becomes hotter, its nuclear energy output decreases. The reactor itself should be located underground, but the generation of electricity should be performed on the surface. The connection should be maintained by gas cooling, probably cooling by helium gas. If less energy is demanded from the reactor for electricity generation, for instance at night, the cooling gas will flow back into the reactor at a higher temperature and the hotter reactor will thereupon automatically produce less energy, resulting in thermostated regulation of its operating temperature.

The reactor must, of course, be emplaced originally by human activity, but it should have no continually functioning control system. Once the reactor is made to start functioning, the only human control thereafter will be to use more or less energy from it to produce electricity. My turning on my electric heater at home will automatically influence the reactor toward working at a lower temperature and thus producing more heat energy to then be converted into electricity.

It would be good to have reactors that can be buried and will function for at least 30 years without refueling. This will require an initial charge of fissile material like U_{235} or Pu_{239}. But these are apt to get exhausted after a few years. There are several ways to extend the reactor's operational lifetime, of which the most important will be to add great amounts of Thorium in an appropriate configuration. Thorium absorbs slow neutrons and gives no fission, but the resulting Th_{233} changes by two β-decays into highly fissionable U_{233}. The net reaction requires two neutrons (one to react with Th_{232}, one with U_{233}) giving rise to fission and a production of more than two neutrons. This chain of heat-generating reactions will continue until the accumulation of fission products bring it to a halt. At that time, only a few percent of the Thorium will be used up, but even that is more than the 0.7% of U_{235} in natural Uranium. Furthermore, Thorium occurs abundantly in China, Russia, the United States, Brazil, India and other places. I propose to forego full utilization of Thorium in order to avoid need for human access to the reactor and any possible need for fuel reprocessing. Both of these are possible sources of accidents.

The last basic point is that once the original charge including the Thorium is used up, the reactor is permanently shut down. This will automatically involve radioactive afterheat. One may choose to limit the resulting temperature rise by distributing this heat over a few hundred feet of the reactor's underground surroundings with the help of originally embedded heat pipes, or one might allow the entire reactor to melt-down and stabilize underground, if that is judged to be harmless.

The most important advantage of all of this is the denial of access to the reactor not only to fools, but also to would-be proliferators. Thus, the prospect of intentional misuse of reactor products can be rendered extremely difficult and indeed impossible without extensive, expensive and quite noticeable activity. Thus Third World countries can be given such reactors for their legitimate energy needs, even if their political stability is not completely assured. Furthermore, Third World countries will not be handicapped by the unavailability of expert reactor operators.

The above example has been given in the hope that either it will be implemented or another scheme with even more obvious safety will be developed. Several of the National Laboratories could contribute usefully on this project.

Today the principal hope for a safe nuclear energy supply is concentrated on fusion energy. I believe that controlled fusion will indeed work in the early 21st Century. However, I do not believe that it will be the appropriate method of massive energy supply for the world. It will actually produce considerable amounts of radioactivity and, if this is an objection to fission reactors, it is an objection to fusion reactors as well. The real objection to fusion reactors is that they are apt to be relatively expensive electricity generators. I nevertheless believe that fusion will find important applications and I hope that the international effort in that field will be continued in several Laboratories.

ENVIRONMENTAL CLEANUP

More than a third of the Department of Energy expenditure is now devoted to the environmental cleanup process. Even so, the postulated cleanup will take more than 30 years. This is an enormous effort. There are increasing demands for research activities to ensure that this part of the DoE program should be effective and economically efficient.

In the minds of many, such research should be connected with the way in which cleanup should actually be performed. I claim that the primary purpose of the research at this time should be directed to investigate whether and to what extent this cleanup is actually necessary for public safety. This is an extensive effort and should be divided among the Laboratories according to their capabilities.

Much of the cleanup work is focused on the danger of radioactivity. There are a limited number of cases where people have been obviously hurt or killed by a few hundred roentgen units (rem-units) of radiation exposure. Such accidents must be avoided and this does not require the expenditure of large amounts of money. The big sums are proposed to be committed because of the widespread belief that the harm caused by radiation is proportional to the dose received, even at low dosages. Actually, in the National Academy of Sciences' BEIR reports, originally this proportionality was asserted as a fact. In the course of decades, the statement was progressively weakened to a probability, to a possibility, and eventually to a circumstance that cannot be conclusively disproved. Prof. Sohei Kondo, a Japanese researcher who spent his life investigating the subject, wrote a recent book, "Health Effects of Low-level Radiation."[1] He concludes that the asserted proportionality is a myth.

Proportionality was originally believed for two simple and obvious reasons. Radiation will create mutations that are in good approximation proportional to the radiation. The mutations will be random. Random changes in the organized system of a living being must be deleterious.

A second line of inference originated from the carefully observed fact that mutations of well defined properties due to irradiation of the male sperm of the fly, *Drosophila melanogaster*, are quantitatively proportional to the dose. But the conclusion deriving from this reasoning has been subsequently weakened by the observation that proportionality does not hold when the spermatogonia (the parent cells of the sperm) were irradiated. Neither did it hold as a consequence of irradiation of mature female sex cells (the eggs). The obvious conclusion is that mutations are repaired and effectively eliminated, but the repair does not operate in the male sperm which is an extremely simplified cell consisting of little more than the essential genes plus an appropriate propulsion mechanism.

Why is this proportionality important?

Most of us are exposed every year to approximately one-third of an rem-unit, less than one-thousandth of a lethal dose. One may argue that this dose or even less is already harmful, but in practice this supposed harm is not observed. If this dose should, for example, be doubled, one would have to investigate millions of lightly irradiated cases before the harmful effect might be statistically observed. The situation becomes even more difficult because the main suspected problem is the cancer-producing property of radiation. We know that this property does not become detectable in people except after many years. Therefore, to prove proportionality of damage to dose at very low doses would require observations of long duration on an enormous scale.

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[1] *Health Effects of Low-level Radiation* by Sohei Kondo; Kinki University Press, Osaka, Japan; Medical Physics Publishing; Madison, WI USA

The radiation effects such as studied by Prof. Kondo give the peculiar evidence that the little radiation that is not much more than the natural background is actually good for you, in the sense of statistically lower cancer risk. Similar evidence has been found by the British in recently published studies of their entire population of atomic energy workers over the past few decades. Such evidence is interesting but far short of being conclusive.

Consider an accident like Chernobyl. More than 100 million people have been exposed to low level radiation from it. Assuming proportionality, this may have caused as many as 100,000 eventual cancers. Therefore, depending on what you believe (in absence of actual scientific evidence), you may expect 100,000 cancer deaths, 100,000,000 slight benefits, or possibly, no effects whatsoever.

The $7 billion spent annually by the Department of Energy on radioactivity-related environmental cleanup is supposed to prevent a potential, but unknown and almost unknowable, danger. If one does not want to criticize this expenditure as a terrible waste of public funds on a gigantic scale, one should at least demand that the level of expenditure be reduced and that part of the remainder be spent to find out what actual level of danger exists in the first place. A call to the National Laboratories asking for proposals for relevant research projects would seem highly appropriate.

Great developments of biochemistry in the last few decades has led to insights regarding mutations occurring in the component parts of the amino acids which make up the proteins, and nucleic acids which make up the genes. The remarkable point is that every day in every one of the 100 trillion cells of our bodies, thousands of mutations naturally occur. But there are some fundamental mechanisms which police these mutations, repairing those which can be repaired and eliminating those cells where the mutations are irreparable and dangerous. These mechanisms appear to be highly efficient and remarkably effective. The action of radiation on living matter and its possible induction of cancer, therefore, now appear as aspects of a quite complex process. Study of this process, incompletely understood though it presently is, gives little reason to believe in proportionality of damage to dose at the low levels to which not only the general population but even atomic energy workers would ever be exposed.

Therefore, I strongly urge that environmental cleanup measures in the Department of Energy be subjected to sharp scrutiny. For the time being, they should be curtailed and a strong, science-centered program to investigate the actual consequences of low-level radiation exposures should be instituted to give any subsequent cleanup program a rational basis.

MILITARY APPLICATIONS

The topics discussed under this heading are primarily the responsibility of the Department of Defense but the Department of Energy participates, usually in a key manner. I shall discuss topics in which both Departments have been collaborating and should continue to work together.

What is called the "Cold War" was actually a rather peaceful period. At the same time, the danger of a nuclear war was a truly terrifying prospect. At this time, the apparent danger is even now diminishing in scale from the possibility of a conflict that could wipe out our country in an hour to a possibility that would merely be by far the worst catastrophe we have ever encountered. At the same time, the probability of great trouble has not decreased as yet. So military preparations, particularly of a technical nature, deserve all the attention we can give them.

It is recognized that in the Cold War the development of novel weaponry played an important role. Our success was due at least in part to the circumstance that our development of nuclear weapons and our development of electronics and of accurate delivery systems did not fall behind Soviet efforts and indeed was apparently the best in the world. Indeed, the Soviet Union spent significantly more effort than did we on military matters. This absolute difference becomes particularly impressive if you compare the respective military efforts as a percentage of the Gross National Product of our nation and theirs. Our democratic system could have never tolerated in peacetime the long-term, massive diversion of national production capacity into military uses as was done by the Communist dictatorship in Russia.

With the ending of the Cold War, these military efforts already have been reduced by as much as 40% in the United States. Such reductions may or may not have gone too far. The work in the Department of Energy as well as my own direct concern is connected primarily not with deployment and overall military expenditures but with research on military instruments. Actually, advancing technology had decisive consequences on many occasions in this century, and it seems to me that the influence of research on national military capability might even become more important in the future. With the tension between East and West diminishing rapidly, international relations, international conflicts and international cooperation all assume new aspects. The result is that the role of the military does not merely change in a quantitative but also in a qualitative fashion. Therefore, research on new weapons systems, nuclear and non-nuclear, that are well-adapted to the new national military requirements may become more important than at any time since the Second World War.

In this connection, it is worthwhile to argue that a military research effort outside the Pentagon may be particularly useful at this time. Big organizations such as the Defense Department are conservative in their nature, and even more so when their budgets are declining. Therefore, radically new initiatives of great potential importance are apt to arise outside such big organizations. For such reasons, I suggest that military developments in the Department of Energy should continue, moreover across a broad front.

Such efforts have been concentrated at the Los Alamos, Livermore and Sandia Laboratories. In the past several years, their collaboration has become increasingly satisfactory. They are much better equipped and managerially prepared, relative to university laboratories, in working with the military in peacetime. They are much better positioned than industrial laboratories in considering changes in National military technical capabilities without regard to immediate financial returns, and they are far more able than the Defense Department's in-house laboratories in proposing qualitative improvements rather than gradual quantitative progress, which are usually specified under the label of "military requirements."

There have been proposals to eliminate perceived duplication of effort on nuclear weapons. Indeed, it has been suggested that, of the two Laboratories emphasizing research in this area, research should be continued only by the older one, Los Alamos, and that Livermore should concentrate on other topics. I believe that such a change would have disastrous consequences for the Nation.

Mistakes in research, particularly mistakes by failing to pursue new potentialities, could have the most serious consequences. From the point-of-view of a proliferating (would-be) nuclear power, the use of non-standard materials, the use of novel methods, in pursuit of unusual military applications may have great advantages. The general topic of nuclear weaponry never has had the widespread scientific development that is common to practically all other bases for military technology.

Reducing advanced research to a single Laboratory should not be called elimination of duplication. It should be clearly recognized for what it is: elimination of competition. I believe that there is no activity in which competition is as vital as is the set of technologies based on advanced research, and that there is no set of technologies as critical to National survival as those underlying National military capabilities. I therefore consider the continued strong support of two nuclear weaponry R&D Laboratories to be an absolute necessity — which does not mean that in these Laboratories military research other than that on nuclear explosives should be in any way neglected.

In a classified session, I would lay before you at least one new line of development that needs near-term attention. The very fact that such a development is most unlikely to occur productively except under the traditional competitive-cooperative approach of Los Alamos and Livermore is in itself a strong reason for the continued dual-Lab approach.

It may also be appropriate to mention five particular axes of technology-intensive military development that should be of special interest to the Congress.

Let us first consider research on nuclear explosives itself. The use of highly accurate weapons was demonstrated in practice in the incredible success of the war against Iraq. This development makes it natural to de-emphasize weapons of high yield and to limit yields to a militarily required value, avoiding unnecessary side effects. Present nuclear arsenals contain many high-power explosives and also others with yields well below a hundred kilotons. The first class is apt to lose importance and even the usefulness of the second class is less certain. With the advent of precision-delivery of munitions and the persistence of crucial military targets which cannot be held at risk with conventional explosives, the question arises as to what extent nuclear weapons of fractional kiloton yields could become pivotal. If these could be used with great overall safety and at low cost, one might consider weaponry having yields of a few tons to several tens of tens of TNT-equivalent but having a weight of perhaps only one-tenth of a ton. In defense against missile attacks, even lower yields but of relatively high neutron output might become important.

I introduce this argument without the intention of making it appear decisive. It is just one of many ways in which nuclear weapons may continue to be very important. Research and development and, more generally, predictions of future conditions remain highly uncertain. A sure way to severely damage research is to plan it by applying general principles or, what is not very different, by succumbing to prejudices.

I therefore propose that the Los Alamos and Livermore Laboratories, as one of several militarily-directed efforts, continue to vigorously explore nuclear explosives.

The second of the five axes is the continued development of the Strategic Defense Initiative (SDI) to eliminate or at least drastically reduce the danger of aggression carried out by missiles. In attempting to create a defense against tens of thousands of Soviet warheads with powerful and sophisticated countermeasures, the difficulties of a perfect defense seemed very great and, indeed, none was sought. Now, a perfect defense against threats such as could be presented by North Korea or Iran or Iraq looks practical even in the relatively short run. To stop a genuine SDI or to shackle it with absurd restrictions makes absolutely no sense. I look to the Congress to inject common sense and the clear will of the American people into a situation which has become seriously detached from geopolitical and military realities during the past two years.

The third axis is the use of space both for purposes of military observation and of weaponry delivery. Not a great deal can be said about this in unclassified session.

The fourth axis is in electronics and in the incredibly rapid development of computers and related technology. This opens the swiftly increasing possibility to replace man by machine in many areas of endeavor in which people prefer to disengage, for example, because the work is drudgery. This, I believe, holds necessarily for the execution of military functions. It does not hold for serious decision-making. Indeed, modern digital technologies applied to military problems should have a two-fold effect: On the one hand, it can reduce the number of military personnel exposed to danger; on the other hand, it can increase the effectiveness of decision-making by a more complete gathering and integration of information, by superior storage/retrieval and more pertinent presentation of information, and by a more effective transmission of human decisions to the scenes of armed conflict.

The fifth axis, already coming into sharp focus, is to reduce the danger to personnel who still must be on the scene of combat. For example, there are counter-sniper developments underway which trace the bullet of a sniper by its infrared image as processed in a computer – as the bullet is in flight. The result is that the sniper is precisely located while his finger is still on the trigger. If one so chooses, an automatic response arrangement can be arranged, so that any act of sniping will be followed in a fraction of a second by a shower of responding bullets. This development is the first really effective active defense against projectile-type weaponry in the several centuries over which they have come to dominate warfare. Its potential significance is difficult to overemphasize. If it had been employed in Mogadishu, the tragedy of the marketplace battle might have been completely avoided.

A parallel development already in its early stages aims to track and destroy bigger incoming projectiles, such as mortar and artillery shells, so that areas of several square miles could be defended rather absolutely against any attack with such fearsome weaponry by a single truck-mounted unit. For example, of the order of a dozen of these units could potentially enforce the "safe havens" which the United Nations has declared, but failed to implement, in the major population centers of Bosnia.

The Department of Energy should continue to sponsor, perhaps at modest levels, innovative research on these breakthrough-quality subjects.

BASIC RESEARCH

Lack of funds has considerably reduced basic research in the Department of Energy laboratories. This is regrettable. It is particularly undesirable if support of research is denied unless applications are already in prospect. I want to mention three examples of recent prospective research of considerable importance.

One is the proposed plan at Brookhaven, known by the designation Relativistic Heavy Ion Collider (RHIC). The proposal, which is at present getting somewhat hesitant support, is to produce collisions between the nuclei of two heavy ions moving in opposite directions with energies of 100,000 Mev per nucleon. The result will certainly be an exploration of nuclear behavior under radically new conditions. It is particularly important to emphasize the development of the observation equipment so that the results of the collisions can be understood.

A second example is the continuing broad use of Los Alamos Meson Physics Facility (LAMPF—now referred to as Los Alamos Neutron Scattering Experiment or LANSCE). I quote a recent important observation: an experiment carried out with high intensity neutron beams produced by this machine. The neutrons were slowed down and two separate beams were produced with the spin parallel and anti-parallel to the direction of motion. Simple symmetry considerations would have led to the expectation of the same behavior for the two beams, but in a few narrow energy intervals, remarkable differences were observed, amounting to tens of a percent in measurable effects. Such effects had already been observed (and rewarded with the Nobel Prize) for electrons, but never before for heavy particles like neutrons.

The last example I want to mention is a most interesting plan to establish at the Lawrence Livermore National Laboratory the National Ignition Facility (NIF). Here lasers of exceedingly high intensity will be used to concentrate energy and compress materials. This will lead to the production of controlled fusion, in itself a process with many applications, and is of great scientific interest. But beyond that, it will lead to the study of compressed states far beyond densities that occur anywhere accessible to human study. This amounts to the development of an entirely new branch of physics. This kind of work had required in the past the relatively clumsy application of a nuclear explosion which permitted only a limited beginning of understanding what will happen to materials when they are compressed to densities many dozens to perhaps even hundreds of times that of water.

In concluding my remarks on both basic and applied research, I must emphasize that such work can be supported from a central location in Washington, but cannot be effectively led and planned in its most important details by anybody but those involved in its direct execution. In these areas most particularly, the disadvantages of Washington-based micro-management are indeed great.

Conclusion

The above statements fall far short from covering all aspects of the work of the Department of Energy. For instance, I have taken for granted the surpassing importance of properly maintaining a reliable stockpile of nuclear weapons. This is one of the most crucial issues for our long-term National security, and like many other deep-rooted national security issues, there does not exist a simple and conclusive solution. What is clearly required, at a minimum, is an array of Laboratories such as has been successfully developed and operated in the past. If these Laboratories are properly supported, are directed from Washington with a lot of moderation and even more understanding, the results in time to come will be as rewarding to the Nation's security as they have been in the past. The ancient advice applies here most compellingly: "If it ain't broke, don't fix it!"

In the proper equilibrium between cautious direction, proper understanding and the enlightenment of the public, your Subcommittee can play a particularly important role.

COMMITTEE ON ENERGY AND WATER DEVELOPMENT

APPROPRIATIONS SUBCOMMITTEE

I have submitted a detailed report on the reasonable assumption that a substantial part of nuclear research and related research carried on in DOE will continue in that Department. I am adding a few remarks about the radical proposal (of low probability) that all that work might be reassigned in a different way. I do not make this recommendation, but I may suggest that a new department--probably called the "Department of Research"--be considered and possibly established after one or two years of detailed planning.

A Department of Research may have as its objective the general planning of applied science Basic science would, of course, have to be included, but should consume a minor fraction of the expenditures.

Work on science in other organizations such as, for instance, the Pentagon or NASA, must continue, but a new department should concentrate on the general application and acceptability of rapidly developing technologies. These technologies have growing effects on our society, which in my opinion have been favorable, but their very speed has generated severe public concern as is evidenced by public worries. That is particularly true of everything connected with the atomic nucleus. A further evidence is a book written by the second highest official in the United States: “Earth in the Balance”.

The older American tradition is to welcome any new development in technology. The trend of the last decade has been to question, to regulate and to restrict any new development, whether it is connected with the atomic nucleus, with a possible change in climate, or with the application of recombinant DNA on the oldest human activity of modifiying living organisms of the vegetable, animal, or most recently, monocellular variety. The rapidity of progress and the possibility of further increases in this rapidity deserve attention. The justification of funding of applied science, the spelling out of dangers of applied science and technology together with elimination of such dangers, might enhance the rapid development and increase its acceptability by the public..

At the present time, the Office of the President has an advisory body that addresses this problem. What I am proposing is an organization, not merely to advise, but to execute and to take full responsibility for its actions. The responsibility of the President in this process will be essentially simple--to be responsible for the actions of this department or of any other department.

To summarize--America has been and still is the place where applied research had its deepest effects. Today, America is the place where applied research is questioned in a particularly severe manner. Our actions in this respect will obviously be of great importance for the future of our country and even of the world. Questions of defense, of applied biochemistry, and of environmental hazards may be properly addressed in a appropriately specialized manner by various departments. It might be a good idea to give consideration to establishment of a Research Department to oppose, to support, and to execute applied science work on which our future depends and which has to be performed without excess risk and with the acceptance by the public.

Edward Teller

A Biographical Sketch

Dr. Teller is best known to the public for his work on the development of nuclear explosives and for his advocacy of a strong defense for America. He is also a noted physicist with more than 100 technical publications, several books, some patents, and numerous articles in the popular media.

Born in Budapest in 1908, Dr. Teller worked at the University of Leipzig as a graduate student under Werner Heisenberg and received his Ph.D. in 1930 in physics. From 1931 to 1935, he worked at the University of Goettingen with James Frank. With the rise of the Nazis, he left Germany, worked in London and in Copenhagen at the Niels Bohr Institute. In 1935, Dr. Teller was appointed Professor of Physics at the George Washington University in Washington, D.C. He became a citizen of the United States in 1941.

Prior to 1939, and the announcement to the scientific community of the discovery of fission, Dr. Teller was engaged as a theoretical physicist working in the fields of quantum physics, molecular physics and nuclear physics. The possibilities of fission, together with the menace of Nazi Germany, led him to work on the Manhattan Project. At an early stage, the possibilities of releasing energy via nuclear fusion became apparent and much of his attention was subsequently devoted to this development.

After World War II, Dr. Teller became Professor of Physics at the University of Chicago, where he remained until the threat of Soviet technological developments motivated him to return as Assistant Director to Los Alamos Scientific Laboratory. In 1952, at the time of the first test of the hydrogen bomb, Dr. Teller joined the University of California at Berkeley and started work at the newly-founded Lawrence Livermore Laboratory; in 1953, he was Associate Director, and from 1958 to 1960, Director. In 1960, he became University Professor of Physics at the University of California while retaining the position of Associate Director at Livermore. He retired from these positions in 1975, and has held the positions of Director Emeritus at Livermore and Senior Research Fellow at the Hoover Institution since then.

Dr. Teller has served our nation in many capacities, some of which are: as a member of the General Advisory Committee of the U. S. Atomic Energy Commission, as Chairman of the first Nuclear Reactor Safeguard Committee, as a member of the USAF Scientific Advisory Board, on the President's Foreign Intelligence Advisory Board, a board member of the Defense Intelligence School and a member of the National Commission on Superconductivity. From 1982 to 1989, he served as a member of the White House Science Council.

Dr. Teller has received many honors and medals for his work and contributions to scientific developments and to the defense of western democracy. Some of these honors are: the Enrico Fermi Medal (for contributions to chemical and nuclear physics and for leadership in thermonuclear research), The Albert Einstein Award (for discoveries in Atomic, Nuclear and Solid State Physics), the Joseph Priestly Award, the Harvey Prize, the National Medal of Science and the Presidential Citizens Medal. His books include The Legacy of Hiroshima, The Reluctant Revolutionary, Energy from Heaven and Earth, Pursuit of Simplicity, Better A Shield Than A Sword and Conversations on the Dark Secrets of Physics (1991).

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Mr. MYERS. Well, thank you, Dr. Teller. I am quite certain there will be more than one question. You have at least hit some things here that we are going to have to question and ask a little bit thorough explanation.

May I ask here, if we don't have time for all the questions, if we provide written questions, could you respond in the next week or so to those written questions? Will you cooperate, are you able to do that for us?

Dr. TELLER. Please, there cannot be too many. I will not be——

Mr. MYERS. Okay. Be careful making that statement.

Dr. TELLER. If you fax the questions to Livermore, they will forward them to me, and I will make every effort to give you complete and prompt answers.

Mr. MYERS. Thank you.

NORTH KOREA REPROGRAMMING

For the moment, we are going to deviate from your testimony and do some housekeeping here. On Thursday afternoon, the committee had a request for a reprogramming from the Department of Energy, for starting to implement the nuclear agreement we have with North Korea, made last year, on the reactor, and there are some questions this committee wants to ask.

Because we are getting into some classified areas, it will be necessary for us to close that. So at this time the committee will recognize former Chairman Tom Bevill for a motion.

Mr. BEVILL. Thank you, Mr. Chairman.

Because the Subcommittee on Energy and Water Development will be dealing with national security and other sensitive matters at the hearing on Thursday, as the Chairman has pointed out, I move that this hearing on Thursday be held in closed session.

Mr. MYERS. The clerk will call the roll.

The CLERK. Mr. Myers.

Mr. MYERS. Aye.

The CLERK. Mr. Rogers.

Mr. ROGERS. Aye.

The CLERK. Mr. Knollenberg.

[No response.]

The CLERK. Mr. Riggs.

Mr. RIGGS. Aye.

The CLERK. Mr. Frelinghuysen.

Mr. FRELINGHUYSEN. Aye.

The CLERK. Mr. Bunn.

Mr. BUNN. Aye.

The CLERK. Mr. Livingston.

Mr. LIVINGSTON. Aye.

The CLERK. Mr. Bevill.

Mr. BEVILL. Aye.

The CLERK. Mr. Fazio.

Mr. FAZIO. Aye.

The CLERK. Mr. Chapman.

Mr. CHAPMAN. Aye.

The CLERK. Mr. Obey.

[No response.]

Mr. MYERS. Being nine in the affirmative, no noes, the meeting will be closed on Thursday.

Now it is your time again, Dr. Teller.

Chairman Livingston, do you have some questions?

Mr. LIVINGSTON. Thank you very much, Mr. Chairman, and congratulations to you officially. I haven't had a chance to tell you that. But I am glad to see you here. And certainly want to wish Tom Bevill my best. He was an outstanding Chairman over all the preceding years and I look forward to working with him as well.

Mr. BEVILL. Thank you, Mr. Chairman. I would like to extend the gentleman's time there, if you will.

Mr. LIVINGSTON. I will not take too much time. But thank you, Dr. Teller, we are delighted to have you here with us, sir, and appreciate your great comments.

I think that everyone should recognize that we should take your comments to heart. You have been the wise voice behind the admonition and programs that we have developed over the years to provide such a great defense for this country, but especially I particularly appreciated your concern for a missile defense against potential incoming threat in the Nation.

I happen to believe that the American people in the continental United States really face no significant threat of war from any quarter of the world, but there is always the possibility that rogue missiles might be launched one day from some strange power, some maniac who might figure that he might be able to get away with it. And it is a shame that today we have no defense against that blind attack. But had we listened to you years ago, we probably would have one deployed today, and I hope that we will remedy that defect or deficiency.

At any rate, we are glad to have you here and I have no questions. I just look forward to hearing the testimony of you, and of the other witnesses. And I also appreciate your comments on behalf of solid research. We need it to develop not only our defenses, but to provide seed corn for a better lifestyle and quality of life in the future. And I will stop there.

Thank you very much.

Mr. MYERS. Chairman Bevill.

Mr. BEVILL. Thank you, Mr. Chairman.

Mr. MYERS. Once a Chairman, always a Chairman.

CLEANUP RESEARCH

Mr. BEVILL. Dr. Teller, I would like to add my thanks to you. You have been most helpful to this committee throughout the years in your advice, and we have always certainly appreciated the good advice that you have given us. You have mentioned there that you feel that we have wasted a lot of money, that $7 million of that $17 billion—a lot of it has been, if not all, has been wasted. And that concerns me, because I agree with you that there is a lot of waste in the cleanup money. And then, I believe I followed you there, you recommend that more of the money be put into research on this waste and determine which actually should have priority on cleaning up.

I think that is a good suggestion. But then when we go over into more research, the first thing we know, the research is going on and gets to be routine and doesn't produce anything there.

Would you have any other alternative?

Dr. TELLER. I think, I know, there is no alternative to the acquiring of knowledge. Let me perhaps outline to you why the question is a difficult one. We know that thousand roentgen units, these other units immaterial, is measured, is very dangerous.

The oversimplified assumption says the probability that there will be billions of one roentgen from one roentgen unit is one in a thousand. All of us get per year one-third of a roentgen. There is a danger of one in 3,000. By statistical investigation, to find the danger of one in a thousand, we have to look at a million people, a thousand square people. Or at least as many animals, although the animal experimentation in itself is not conclusive.

Furthermore, we are mostly worried about cancer, and we know for a firm fact that the immediate danger of cancer is none, does not exist. It shows in a few years.

Therefore, we are talking about, if you really want a straightforward approach, an investigation of millions of people over years.

That says two things. One is your question, will the research get anywhere, is justified.

Second, it gives you an impression of how small the danger is if it takes a study of millions of people even to notice it. I think that in a sense, in a way of common sense, you should realize.

But now let me give you a way out in which I was personally involved, not in the United States but in Hungary. The daughter of an excellent Hungarian poet by the name of Toth, T–O–T–H, has a project measuring radiation, teaching her kids in high school to measure the radiation. Then she took them, went into a village where there was extra radon. I went with her to that village. Rows of houses, some houses have radon, some houses don't have radon. They measure it everywhere. The kids are much more welcome than officials would be. And that is not enough. The radon is 10 times as much as the natural background. Even so, few cases.

There have been a hundred deaths in the last year in that village. They looked for them in categories, most radiation, most radon, less, less, less, and find the correlation, a little radiation is good for you. That is what they find. But the cases are so few, that it is inconclusive.

Well, my contribution was that I wrote a letter, that lady needs money. She got almost a million dollars. No, a million pengo, which is only $5,000. By that, she could expand her investigation tenfold. Then it begins to mean something, whether multiplying the background radiation by a factor of 10 will or will not have an effect.

But how do you do it? Not easy. She goes and talks with individual doctors, making a lot of medical questions. Did he or did he not die of cancer? If he was in bed on account of cancer, and by being in bed got pneumonia, then the certificate shows pneumonia and not cancer.

One needs to look into all kinds of details. One needs to talk to doctors, one needs to talk to people in the houses, so they themselves expose themselves to less danger. I see here in a small example what even one person can do. I agree that the research that we are talking about here is not easy, but it can be done, it must be done, and it can be done with care and foresight.

NATIONAL LABS

Mr. BEVILL. Like you, I have always been very pleased with our three weapons laboratories that we fund each year. I have gotten the impression that you feel like—well, let me say this, that it has been discussed, the possibilities, of closing one or two of those labs. And I wanted to get your opinion on that. What do you think, what is your thinking about it?

Dr. TELLER. I think it would be a big mistake. I do not believe that it is even considered. I do believe that it is under consideration, that possibly one or two of the laboratories should be directed away from military research and toward other types of research. I believe that, too, would be a very big mistake.

In military research, the enumeration of the problems as they are given or as they can be given by foresight, is not sufficient. For instance, we in Livermore have made a real contribution to missile defense, which had something to do with the incomplete but yet not negligible effect, the positive effect, that our Patriot missiles had in limiting the damage from Iraqi missiles. Had we operated under the kind of restriction that is now fashionable, we could not have done it.

I heard a statement, and I will not quote the person who made it, a highly placed person, who told us, work on national security, but don't work on weapons. What does that mean? Do we want to secure the Nation against carbon dioxide?

Mr. BEVILL. Thank you very much.

Thank you, Mr. Chairman.

Mr. MYERS. Thank you, Tom. Mr. Rogers.

SOLAR AND RENEWABLE ENERGY

Mr. ROGERS. Thank you, Mr. Chairman.

Dr. Teller, we are delighted to have you with us. We all admired your work and your articulate description of our needs over the years.

Now, as I understand it, you maintain that we ought to cut research funds for solar and wind projects. Is that—am I correct in that?

Dr. TELLER. I did not say that explicitly, and I don't mean it. I have worked on both. I think both of them are effective. At the right place. You use solar energy where there is solar energy. You use wind energy where there is wind energy.

I went to Hawaii where you know the ranges channel the trade winds so there are places where the wind is strong and almost completely steady. I went out and advocated wind energy very explicitly. You know what I found? Don't do it, the windmills pollute. Pollute? Yes, visible pollution, they are ugly. I think that at the right place where there is wind, where there is solar energy, I want them.

I am consulting with a little company in Michigan, Energy Conversion, ECDI, I believe, Energy Conversion Devices, which made real progress in efficiency of the solar cell. They did not get support for it in the United States, but they went ahead with Japanese support.

NUCLEAR ENERGY RESEARCH

I certainly don't want to stop other approaches to energy, but I claim that nuclear energy can be very safely used, used in a way that is available to everyone, that cannot be touched by human hands, and therefore is foolproof and dictator-proof. I described it in my submission. To a great extent based, partly based, on an already existing reactor, high-temperature gas-cooled reactor, put underground and deprived of moving parts.

One could accomplish great simplifications; and those could be made available in much more wide distribution than solar or wind energy, which in spots are very valuable, as is geothermal energy. Where it is, use it. But these things will not solve the general problem, they are not generally available.

ENVIRONMENTAL CLEANUP

Mr. ROGERS. And then lastly, you suggest that we should be able to cut a good portion of the $7 billion that we spend on nuclear cleanup each year. What would we do if we did that with the contaminated sites that are there? Just fence them off? Or do nothing?

Dr. TELLER. Find that they are not contaminated to a significant extent. We are talking about contaminations that in fact I claim may well be harmless. What I am talking about is establish more reasonable criteria.

There is today legislation, mistaken legislation, that to begin with uses the language, maximum permissible dose. Who permits? These maximum permissible doses have not been proved harmful, practically in any case.

The language you should use is not comparison with something you believe is permissible. It should be comparison with the background radiation. That would be a good starting point. Then a study of what multiple of the background radiation can be demonstrated to be of any harm, those places I would like to clean up in a reasonable way, but I claim that today we are trying to clean up many places which are in fact not contaminated.

Mr. ROGERS. Thank you, Dr. Teller.

Mr. MYERS. Mr. Fazio.

DEFENSE ACTIVITIES AT DOE

Mr. FAZIO. Thank you, Mr. Chairman.

Dr. Teller, you have played such a key role in our modern history and particularly have been involved in so many fundamental decisions about how we organize government to provide national security. I wonder if you could give us some historic background on the decision to place our nuclear weapons production facilities in the civilian Department of Energy, and whether or not you think that some of the suggestions which normally involve doing away with the Department are wise in light of that fundamental decision made years ago, to prevent the weapons facilities from falling under DOD's purview.

Perhaps you would agree with the plans to change dramatically DOE, but what would you do with the nuclear weapons program? I will be interested in your historic view of this as well as your contemporary thoughts.

Dr. TELLER. My thoughts have not changed. My opinions have intensified. We have been often accused of working on weapons of the last war. I believe that—though let me put it this way. I have made a big discovery. I discovered the most inert substance in the world, and that was the human brain. There is only one more inert, which is a collection of human brains.

Mr. MYERS. I thought we call that a committee here.

Dr. TELLER. Sir, your committee is a smaller collection of human brains.

Mr. MYERS. Well, the House of Representatives is a larger collection.

Dr. TELLER. Look, the pentacle, or the faculty of a university, are bigger collections. I think, I think and I hope, that my discovery has its limits. And among the groups of people and their inertia, Congress has the specific job to disagree, has the specific job to debate. And therefore is less exposed to the danger of immobility, of inertia.

I believe that the big organization tends to be inert, and therefore I wanted as a balance to have the development of nuclear weapons not in the public.

Now, I think that there are many ways to criticize DOE. If there is a change—and I outline it in the two pages that I added to my statement—if there is a change, I want a partial change, getting a department of research or a department of science and technology, so that the question of weapons of this or that kind, the question of how to use space, the question what to do with carbon dioxide, the question what to do with recombinant DNA and the new species that can be made, that these questions should be looked at from the point of view of application. Here they are in the third place. But should be always looked at also in a central way by the department of research.

So in this sense, if I would now make a change from DOE, I would not put it back into the Department of Defense. I would put it where it never was.

Mr. MYERS. Put it where?

Dr. TELLER. I would put—I would divide the responsibility between the DOE and the department of research. I don't know whether that answers your question. This was originally my feeling, that a civilian representation would be good, in addition to the needed military.

Mr. FAZIO. Thank you.

Thank you, Mr. Chairman.

Thank you, Dr. Teller.

Mr. MYERS. Mr. Knollenberg.

Mr. KNOLLENBERG. Mr. Chairman, I apologize for coming in a bit late. I missed some of the testimony. I am enjoying what I am hearing, and I would like, if I could, to yield to my colleague, Mr. Riggs, in my stead, if that would be permissible.

Mr. RIGGS. I appreciate the gentleman, but I think, Mr. Chairman, I will just wait and take my turn.

Mr. MYERS. Well, Mr. Chapman, then. Maybe you will think of something, Joe.

Mr. KNOLLENBERG. Thank you.

Mr. MYERS. You reserve your time.

Mr. KNOLLENBERG. I reserve my time. Thank you, sir.

Mr. MYERS. Mr. Chapman.

FEDERAL ROLE FOR RESEARCH AND DEVELOPMENT

Mr. CHAPMAN. Mr. Chairman, thank you. And, Dr. Teller, welcome.

I have only one question. If I understood correctly, the general thrust of the testimony at a hearing in this room a week or so ago, a group of panelists basically said that there was no appropriate Federal role for research and development; that all, particularly in the area of energy, the recommendations were, without going into great detail, that we could cut the budget by more than in half, we should not do anything there that could conceivably be done in the private sector.

I ask you a simple question. In reading your testimony, the answer to me is obvious, but I would like to hear you say it. Do you view as appropriate the active involvement and an appropriate Federal role in basic research within the Department of Energy as an important policy and real function that we ought to be engaged in as a country?

Dr. TELLER. Yes.

Mr. CHAPMAN. Thank you.

Dr. TELLER. Absolutely, yes.

Mr. CHAPMAN. I would—I would think that that single-word answer, Dr. Teller, is significantly more telling than a lot of rhetoric we heard here a week or so ago, and I appreciate your response.

Mr. MYERS. Is that it, Jim?

Mr. CHAPMAN. That is it.

Mr. MYERS. Now, Mr. Riggs, if you are ready to be recognized.

RELATIONSHIP BETWEEN LABORATORIES AND UNIVERSITIES

Mr. RIGGS. Thank you, Mr. Chairman.

Good afternoon, Dr. Teller.

Dr. Teller, I would like to, I guess, in a way follow up the last gentleman's comments by asking you how you perceive the relationship or the partnership between our research laboratories and our universities. And is there, in terms of some of the research projects you advocated in your testimony today, is there any kind of cost savings to be achieved?

Dr. TELLER. Is there?

Mr. RIGGS. Is there any kind of cost savings to be achieved by somehow strengthening or revisiting the relationship that some of our Nation's universities have with the research laboratories?

And then related to that, as again it touches on the last gentleman's comments, what is the proper role for the private sector and private industry in basic energy research in this country today?

Dr. TELLER. Research is—has its strong individual color. I would like to quote one of my favorite authors, Arthur Kussler, a Hungarian who wrote in English. He wrote a wonderful book, worth reading, about the Copernican revolution. I don't recommend it for legislation, I recommend it for enjoyment.

The title of the book is, "The Sleepwalkers." The sleepwalkers are scientists. They are like sleepwalkers, for they don't know where they go, but they get there. You try to regulate the sleepwalkers, and they will accomplish nothing, and they won't get there. And he illustrates that.

For instance, in the case of Galileo, who in many of his activities, his political activities, was more frequently wrong than right. Still, in very important respects, he got there first.

I think that the government laboratories have their past, and their future depends on their past. So do the universities. And each individual case should be discussed and there are no general rules that say this laboratory must do this kind of thing, that laboratory must do that kind of thing. But if a laboratory has performed in the past, it will perform in some way in the future. That is the character of the laboratory, as it is in the character of an individual person.

You know, I would like to give you a concrete example. High energy research, finding the ultimate reason how things hang together, there have been recently two proposals, and I will give you my opinion, that may be wrong, but it illustrates the complication and the confusion. You know both proposals. One is the SSC, the Superconducting Super Collider, a university proposal. The other is the RHIC, the Relativistic Heavy Ion Collider. They are similar. Both use accelerators.

The university proposal was much more expensive and in my opinion impractical, and Congress did a wise thing in stopping it. RHIC is much more simple. Compare the expense of $15 billion with the expense of half a billion dollars. Compare the time of 15 years of work with a time of four years of work, until you get results.

In this case, in a field where the university should have had the best proposal, they did not have the best proposal.

Mr. RIGGS. Dr. Teller, since time is very short, if you will pardon me for just interrupting, to ask a short follow-up that builds on your answer, since you are obviously personally quite aware of the work of Lawrence Livermore, and I think you maintain a current affiliation there, I wanted to ask you to help us reconcile the potential conflict between our task here, which is to find specific programmatic spending cuts within the Federal budget, and your admonition against micromanaging from Washington basic energy research.

And I wondered if you could use as an example, you advocate a continuing role for Lawrence Livermore in, quote, "vigorously exploring nuclear explosives."

Dr. TELLER. Yes.

Mr. RIGGS. Defense weapons research, and then a couple of pages later, you talk about a most interesting plan to establish at Lawrence Livermore a National Ignition Facility that would further research the whole scientific theory of controlled fusion. How are we going to then reconcile those potential conflicts?

Dr. TELLER. I don't have exact numbers, but in the last 10 years, the whole budget of Livermore has been reduced by maybe 20 percent or 30 percent. The weapons budget has been reduced by 50 percent.

Mr. RIGGS. Fifty?

Dr. TELLER. Yes. I am afraid it might be reduced to zero, and we may be told that all of it should be spent on nonweapons research. That would be a big mistake. I think in Livermore, as it was 10 years ago, approximately half going on weapons, half going on all other research, is a reasonable distribution, but should be judged year by year on the merits of performance.

Mr. RIGGS. Thank you, Dr. Teller.

Thank you, Mr. Chairman.

Mr. MYERS. Thank you, Frank. Mr. Frelinghuysen.

DOD RESEARCH INITIATIVES

Mr. FRELINGHUYSEN. Thank you, Mr. Chairman.

Dr. Teller, good afternoon. You stated in your prepared statement on page 11, I thought it was an interesting commentary, I don't mean to take it out of context, and I quote, "Big organizations such as the Defense Department are conservative in their nature, and even more so when their budgets are declining. Therefore, radically new initiatives of great potential and importance are apt to arise outside such big organizations."

What has the Defense Department done that might be considered to be a radically new initiative that you might be able to cite, or have they been limited by their appropriations?

Dr. TELLER. I wish I had more knowledge to give you an overview on this. From my limited point of view, you know, I am limited, because I am interested in my research and closely related subjects, and from an organizational point of view, I have not been interested.

The one great contribution from the Pentagon was defense by heat-seeking missiles. I forget now the name of the laboratory, I should know it, in Southern California, a very good laboratory, good.

Mr. FRELINGHUYSEN. Well, let me say, I think that the—and I don't mean to sound parochial, but I get the feeling that there are—that the Defense Department, people who work for the Defense Department, there are a lot of excellent scientists and engineers who continue to develop what I as a layperson would consider to be some radically new initiatives. And I am just wondering here whether there is a—I am sure that the three national laboratories have done some spectacular things, but that maybe the Defense Department ought to be given some credit for their own capabilities.

Dr. TELLER. The Defense Department's capabilities, in most cases, have been spent on improving existing missiles by 20 percent, by 50 percent, by hundred percent. This can be big savings in money. But they are, with few exceptions, not radically new approaches.

Dr. FRELINGHUYSEN. But the savings for the development of those type of armaments are a savings, of course, of life. And from what I gather of our war in Kuwait and Iraq, a lot of those defense capabilities, the responsibility for a lot of those armaments were shared between a lot of different people, including engineers and scientists that work for the Department of Defense.

Dr. TELLER. I am very sure that you have an important point and I should not belittle the advantage in doing things even 20 percent better. It could be a very big item. But the very big progress in three fields, nuclear explosives, computers and their application, lasers, have come from outside the Department.

Mr. FRELINGHUYSEN. Thank you for your response. I am certainly not going to challenge that answer, not from you.

Mr. TELLER. I wish I could give a more complete answer, and I would like to agree with you to some extent. One man with whom I usually agree very thoroughly, and not in this case, is my good friend, Johnnie Foster, who would like to put more responsibility back into the Pentagon. I don't agree with him, but when Johnnie disagrees with me, Johnnie Foster, I have my doubts whether quite possibly I might be wrong.

Mr. FRELINGHUYSEN. Well, thank you, Mr. Chairman. I just wasn't sure who to give credit to the smart bombs to, whether that is—who developed. A lot of people, a lot of good brains. Thank you.

Mr. MYERS. Thank you, Rod. Mr. Bunn.

HANFORD TANKS

Mr. BUNN. Thank you, Mr. Chairman.

Dr. Teller, you said the long-term low levels of radiation, you believe, may well be harmless, and that we need to do further study on that. With Hanford having leaking storage tanks, how can we not invest a great deal in the cleanup, if we need to be studying but we are not sure about the effects? How can we wait?

Dr. TELLER. Sir, I want to make a claim. Before 1950, I was chairman of the first reactor safeguard committee. Our committee put all kinds of emphasis on the leaking tanks in Hanford. That is a real problem, should have been taken care of a long time ago, and the potentialities are there.

Now, I would like to say one thing. Something has happened there. We have made underground nuclear explosions, and studied the spreading of the wandering of radioactivity underground. We now know much more about the consequences of leakage than we have known before. But that the possibility of leakage in Hanford is a serious one, serious from the point of view of having to be studied, is right. Fortunately and otherwise, as far as I know, it did not get to any dangerous extent, and the reason one was afraid of it is because of exaggerated fears of low-level radiation.

But the very fact of leakage is an important one, and I might tell you that in the Soviet Union there was an explosion in a tank, you know, I believe in 1957, which led to evacuation of big areas, rightly so, and such big scale leakages. These are the things I am really worried about. And to be very sure that they cannot occur here is something important. But the leakages that have occurred in the past have been in people's minds, and I don't believe that they have had a great—have done any perceptible damage so far, but that has to be investigated in detail and proper action afterwards taken.

Mr. BUNN. Thank you.

FUSION ENERGY

Mr. MYERS. Well, thank you, Mr. Bunn.

Dr. Teller, in your prepared statement you refer to fusion, supporting fusion, but the Department of Energy and we do not have all the resources that we need. The fact is that we have not probably supported fusion in the past, even though the Chairman and I came on this committee 25 years ago and this committee has been a supporter of fusion, but not in the dollars that fusion probably has needed. In light of all of this, what would you suggest for our committee as we face our responsibility here? We have the TPX construction and international ITER.

What would you recommend we do with the limited resources we are going to have for fusion this year?

Dr. TELLER. I have not asked for more money for fusion for two reasons. There is substantial spending on the subject, and I believe that ignition maintaining fusion will be accomplished within a few years. I think that will be very interesting. I think it will have applications.

My guess is, and I would put it a 10-to–1 guess, not as a 100-to–1 guess, that when we will know when we will have big-scale fusion, it will be much more expensive than the fission reactors, than reasonable fission reactors would be.

NUCLEAR REACTORS

Mr. MYERS. Well, on the fission reactor that you are speaking of here, of course this committee and the Department has been depending upon the light water reactor primarily. Now we are on the advanced light water reactor and a lot of research is being done, but there are no buyers today. We also now have the gas reactor, the even new version of gas reactor.

Do you have any opinions on comparison of the two? Do we need to advance the resource in both of them or settle on one?

Dr. TELLER. I am, myself, much more interested in the high-temperature gas-cooled reactor. Among the reactors that have been worked out to some detail, I would prefer it to the others.

The reactor I am proposing in my written statement, an underground reactor without moving parts, I think would be much more safe, and also would be much more difficult for an aggressor to misuse. This reactor should operate without human intervention on demand.

I agree with the design of that reactor. It is helium cooled, and it is controlled and its controls would simply consist in using more of the energy or less. If you use less of the energy, the coolant goes back into the reactor, still pretty warm, and the point in the reactor is the property already cast, at high temperature it works less well. That property could be further emphasized and by so emphasizing you would not need control rods, you simply would govern the reactor by using or not using electricity.

If you then add to it further features that I have tried to describe, no exchange of fuel rods either, but putting in enough fuel to make the reactor work for a long while, and then let it start where it is under conditions where the reactivity is in a safe continuation and will stay so, I think that is the kind of answer we are looking for, and the high-temperature gas-cooled reactor is a reasonable step toward it.

But even without the improvements that I suggest, the HTGR or its modification is probably the best advanced reactor I know of.

ENVIRONMENTAL CLEANUP

Mr. MYERS. Thank you.

You had several discussions here about what we should do with our nuclear waste, and the cleanup of the environmental cleanup of nuclear waste. Sometime ago I read an article, and I am sorry I can't recall, having to do with the threat, the terrorists of the world. This particular article said the threat wasn't coming from hijacking an airplane, but the threat of terrorists obtaining plutonium and poisoning the world.

I detected from your discussion here that maybe that is exaggeration. Am I correct on that, Dr. Teller?

Dr. TELLER. Yes. The fact is the danger of plutonium appears to have been exaggerated. Levels have been announced, dangerous levels. The fact is that in Los Alamos, during the war, some two dozen people had been accidentally exposed to levels which are now considered to be dangerous. Not many of these people are still alive, and those who have died, died in car accidents or of causes that are in no way associated with the radioactivity of plutonium.

If you are specifically interested in plutonium you might get—or if you wish, I will get to you a report from Los Alamos evaluating the danger from plutonium.

[The information follows:]

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Paper

A 42-y MEDICAL FOLLOW-UP OF MANHATTAN PROJECT PLUTONIUM WORKERS

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Abstract—Twenty-six white male subjects, who worked with plutonium (^{239}Pu) during World War II at Los Alamos, have been given medical examinations periodically over a period of 42 y to identify potential health effects. Inhalation was the primary mode of Pu exposures. The latest examinations, including urine bioassay and *in-vivo* measurements for radioactivity, were performed in late 1986 and 1987. The average age of the 22 living subjects in 1986 was 66 y. The diseases and physical changes noted in these persons are characteristic of a male population in their 60s. Estimates of individual Pu depositions, including lung burdens, as of 1987 or at time of death range from 52 to 3180 Bq (1.4 to 86 nCi) with a median value of 500 Bq (13.5 nCi). Four persons from the original group had died as of 1987. The causes of death were lung cancer, myocardial infarction, accidental injury, and respiratory failure due to pneumonia/congestive heart failure. Expected deaths based on U.S. death rates of white males, adjusted for age and calendar year, are 9.2 based on U.S. rates (standardized mortality ratio = 0.41). Subsequent to 1987, three additional deaths occurred from atherosclerotic heart disease, lung cancer, and osteogenic sarcoma. The bone sarcoma case is discussed in terms of Pu exposure, the natural incidence of this disease, anatomical location of the tumor, and bone tumors observed in Pu-exposed dogs. Plutonium deposition in this man is estimated to have been below current radiation protection guidelines.

INTRODUCTION

THIS REPORT is the fourth in a series of studies that documents the health experience of 26 persons exposed to ^{239}Pu (designated as Pu hereafter) in 1944 and 1945 (Hempelmann et al. 1973; Voelz et al. 1979, 1985). They worked on the Manhattan Project during World War II at Los Alamos, NM. This Project, which designed and built the first atomic bomb, involved chemical and metallurgical research of Pu as well as fabrication of Pu parts.

In 1951–1952, Drs. Louis Hempelmann and Wright Langham began these studies of Los Alamos workers who were judged to have the highest internal depositions of Pu as a result of their work in 1944 and 1945 (Hempelmann et al. 1973). This early reference describes the status of 25 living subjects at the time, but not Subject 15, who was deceased and added back into the group in later publications. Their selection of 26 subjects was based on the history of individual job assignments, work conditions, and the results of Pu measurements in urine samples taken during that period.

The purpose of this study is to maintain long-term surveillance of this unique group of workers in order to estimate the Pu deposition throughout their lifetime and to maintain detailed medical records. This information can then be used to compare with existing Pu dosimetry models, radiobiological information, and human epidemiologic studies of Pu workers.

The Pu work in 1944–1945 was partly done in chemical fume hoods, but some operations were performed in open rooms. Balances, centrifuges, and other equipment were used with Pu in open rooms; serious Pu contamination of the work rooms resulted from the uncontained nature of these operations. Personal protective clothing and equipment included rubber gloves, coveralls, and half-face respirators. The previous publications of this study series (Hempelmann et al. 1973; Voelz et al. 1979, 1985) described the exposure conditions and individual exposures in more detail.

Inhalation of Pu particles was the principal mode of exposure to this group of workers. Nose swipes taken on these men at work were often found to contain from hundreds to thousands of α counts per minute (Hempelmann et al. 1973). Intake through contaminated wounds was less important; nevertheless, eight of these persons have a history of potentially contaminated wounds and three had contaminated chemical burns (Voelz et al. 1985). In retrospect, only two injury events appear likely to have contributed significantly in Pu uptake: About 70 Bq (2 nCi) of Pu was measured in 1945 in excised tissue from a wound in the left thumb of Subject 20 and about 280 Bq Pu (7.5 nCi) is still measurable in a former wound site of the right index fingertip of Subject 1.

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Table 1. Medical examination procedures.

Interval medical history	Electrocardiogram (resting)
Physical examination	Pulmonary spirometry
Visual acuity test	Sputum cytology
Audiometry	Complete blood count
Roentgenograms	Urinalysis (clinical)
Chest (PA and lateral)	
Pelvis (AP)	Blood chemistry tests[a]
Right femur and knee	
Dental (r. upper 1st. molar)	Lymphocyte subset analysis

[a] Blood chemistry tests include calcium, inorganic phosphorus, glucose, urea nitrogen, uric acid, cholesterol, high density cholesterol, triglycerides, total protein, albumin, globulin, total bilirubin, direct bilirubin, alkaline phosphatase, LDH, SGOT, SGPT, gamma GTP, creatinine, sodium, potassium chlorides, and carbon dioxide.

These Pu-exposed workers have had medical examinations about every 5 y since 1952. This report documents and discusses the results of the latest examinations done in 1986–1987. In addition, information is provided on three individuals who have died since 1987.

METHODS

All 22 living subjects were brought back to Los Alamos for this study during the period from September 1986 to October 1987. Examinations were conducted to determine health status and to update our estimates of their Pu internal depositions.

The medical examinations and clinical tests used in this study are those employed routinely by the Occupational Medicine Group at the Los Alamos National Laboratory. Special samples were also collected for sputum cytology and peripheral lymphocyte subset analyses. The methodology used for the lymphocyte subset study has been previously described (Stewart et al. 1988). Table 1 lists the medical examination procedures performed in this study.

Our estimated Pu deposition in each individual relies on measurements of Pu excreted in urine. All urine was collected during the entire time the individual was in Los Alamos for his examination. The collection time varied from about 24 to 48 h. The samples were analyzed for Pu using the standard radiochemical method used at Los Alamos (Gautier 1987).

The estimation of residual Pu deposition in the whole body was calculated from the urine excretion data using the PUQFUA3 program developed by Lawrence (1987). PUQFUA3 is an acronym that stands for *PU* Body Burden (*Q*) *F*rom *U*rine *A*ssay, Third Version. The whole-body deposition is estimated for each year using all available urine data for the individual. Partitioning of the whole-body deposition to organs is based on autopsy distributions found in Los Alamos workers. Annual effective whole-body and organ dose equivalents were calculated using the models described in ICRP Publication 30, *Limits for Intakes of Radionuclides by Workers* (1979). The annual dose equivalents can then be summed to give the cumulative total dose equivalent through any given year.

Each person was extensively monitored for internal contamination of selected radionuclides. A total of seven direct *in-vivo* measurements was made on each subject. Several of these measurements were made simultaneously, which shortens the time required for the entire procedure to less than 2 h. Table 2 is a summary of *in-vivo* measurement techniques used to measure internal contamination, including the organs of interest measured, some details of the measurement techniques, detectors used, and minimum detectable activity. Hand counts, although listed in Table 2, were not made on persons who previously have had negative hand counts.

Mortality rates of the Manhattan District Pu workers were evaluated in two ways. First, standardized mortality ratios were calculated to compare the number of deaths observed in this group with the number expected based on U.S. white male rates adjusted for age and calendar

Table 2. *In-vivo* measurements for internal contamination (Vasilik and Aiken 1983; Vasilik et al. 1984).

Organ of interest	Energy range for major radionuclides (keV)	Minimum detectable activity (Bq)	Type of detector
A. 33-min count			
1. Chest	10–140	2035 (^{239}Pu)	Dual 12.7 cm Phoswich
2. Liver	10–200	37 (^{235}U, ^{241}Am)	HpGe[a]
3. Whole body	80–1600	74-111 (fission products)	Ge(Li)[b]
B. 20-min count			
4. Hand count	10–140	37 (^{239}Pu)	Dual 12.7 cm
	10–140	7 (^{241}Am)	Phoswich
C. 17-min count			
5. Liver	10–140	NA(^{239}Pu, ^{241}Am)	Single 12.7 cm Phoswich
6. Thyroid	10–200	NA	HpGe[a]
7. Skull	10–140	NA (^{241}Am)	Dual 12.7 cm Phoswich
8. Left ankle	10–200	NA	HpGe[a]

[a] HpGe = Hyperpure germanium crystal.

[b] Large volume (16.5% efficient) lithium-drifted germanium detector.

Table 3. Estimated Pu deposition.

	Estimated Pu deposition		
I.D.	Bq (nCi) 1987	nCi 1982[a]	Total GBq-s (nCi-y) 1987
7	3180 (86)	62	2710 (2320)
3	2550 (69)	95	5480 (4690)
4	2150 (58)	63	3810 (3260)
9	2000 (54)	40	3540 (3030)
8	1780 (48)	34	1280 (1100)
5	1630 (44)	55	3670 (3140)
1	1590 (43)	51	2460 (2110)
6	1590 (43)	42	2250 (1930)
17	1260 (34)	34	2250 (1930)
18	1110 (30)	33	1910 (1640)
16[b]	670 (18)	7	383 (328)
12	560 (15)	18	1020 (876)
10[b]	520 (14)	14	975 (835)
20	480 (13)	39	859 (736)
11	480 (13)	11	882 (755)
19	410 (11)	10	648 (555)
15[b]	370 (10)	10	218 (187)
24	370 (10)	11	499 (427)
21	370 (10)	8	514 (440)
23	310 (8.3)	8	556 (476)
22	290 (7.9)	8	230 (197)
27[b]	270 (7.4)	7	371 (318)
2	270 (7.2)	8	379 (325)
25	180 (4.8)	3	182 (156)
26	110 (3.0)	4	148 (127)
13	52 (1.4)	2	65 (56)
Median	500 (13.5)	12.5	870 (745)

[a] Values in nCi as published in Voelz et al. (1985).

[b] Deceased. Plutonium deposition and total nCi-years estimated through year of death.

year using the Monson program (Monson 1974). The end of study date for this analysis was the end of 1986. The second method of evaluation was an internal comparison between the mortality in the Pu worker group and that of unexposed contemporary Los Alamos workers. The selection criteria for the comparison group were: 1) Los Alamos male workers hired in 1943–1945; 2) born within the same range of birth years (1908–1925) as the Pu workers; and 3) without history or evidence of Pu exposure. A total of 876 workers met the criteria, and all were used in the analyses. Vital status for these workers was known through 1983. This internal comparison study was made by computing a stratified maximum likelihood estimate of the rate ratio and 95% approximate confidence limits using the method of Rothman and Boice (1979).

RESULTS OF DOSIMETRY AND RADIOACTIVITY MEASUREMENTS

Key to our understanding of the internal α radiation doses in these persons is the estimation of Pu deposition that occurred primarily in 1944–1945 and its subsequent retention in the body. This estimate for these individuals rests principally on measurements of Pu excretion in urine because direct *in-vivo* measurements of ^{239}Pu or ^{241}Am usually have not been above our minimum detection limits.

The estimated Pu depositions in these men at the end of 1987 or through the date of their death cover an interesting spectrum of values from 52 to 3180 Bq (1.4 to 86 nCi). In terms of the former lifetime occupational protection guideline of 1480 Bq (40 nCi), the range is from less than 5% to over 200% of the guideline. The results of the calculation of internal deposition of Pu as of the end of 1987 are listed in Table 3. These values consider all urine samples collected since 1944. Some urine sample results are determined, however, to be outliers by a confirmation process built into the PUQFUA3 program. The Table also lists the published 1982 estimates for comparison (Voelz et al. 1985).

Comparison of the 1982 and 1987 estimates shows the majority have had little change. The 1987 median estimate of 500 Bq (13.5 nCi) is nearly the same as the 1982 median. Subjects 7, 3, 9, 8, 16, and 20 show significant changes between the 1982 and 1987 estimates of Pu deposition. These differences are attributable primarily to the Pu measurements in their latest (1986–1987) urine samples. The 1982 estimate of 259 Bq (7 nCi) deposition for Subject 16 was wrong because an erroneous urine value was used. The 1987 estimate of 670 Bq (18 nCi) is the corrected value. For Subject 20, the Pu excretion in the 1986 sample was much lower (3.7 Bq per 24 h sample) than the 1981 sample (26 Bq per 24 h sample). The 1986 sample was confirmed by later samples. As a result, the 1981 sample is considered to be invalid by the PUQFUA3 confirmation criteria and is not used in calculating the 1987 estimate. Nonconfirmation of the 1981 sample resulted in the lower 1987 estimate.

In addition to estimating the residual internal Pu deposition at a specific point in time, it is particularly useful to integrate the activity deposited in the body over time since exposure. For this purpose we have used the unit gigabecquerel-s. This unit is the summation of Pu α disintegrations in the total body since the initial exposure. In Table 3 are listed the gigabecquerel-s (nCi-y) estimated for each person through 1987 or the year of death. Comparison of the cumulative α disintegrations estimate and the latest 1987 Pu deposition for each individual shows some significant differences in their order and correlation. These differences are probably due to the particle sizes

Table 4. Examples of calculated organ dose equivalents through 1987 for six Manhattan District Pu workers.

		Dose in sieverts		
ID No.	GBq-s	Bone surface	Liver	Lung
3	5480	57	12	38
4	3810	40	8.1	26
18	1910	20	4.1	13
20	859	9	1.8	5.9
24	499	5.2	1.1	3.4
13	65	0.68	0.14	0.45

and chemical forms of the individual exposures as well as an effect of the time intervals between urine samples that influence the PUQFUA calculations.

The gigabecquerel-s estimate for each individual is the basis on which organ dose equivalents are calculated using the methods described in ICRP Publication 30 (1979). Bone surface, liver, and lung doses for selected individuals are listed in Table 4. These calculated doses are provided as examples of organ dose equivalents that may have occurred to these individuals. Such calculations must be recognized as crude estimates with wide margins of error. This is true not only because of errors in estimating the Pu deposition, but also the inestimable differences in internal distribution between organs from one exposed individual to another. This has been shown repeatedly in the autopsy tissue studies. For example, Kathren et al. (1988) reviewed 43 autopsies for ^{239}Pu deposition and showed that the bone content on average was 53 ± 18% of the total in bone plus liver. The range of actual values was from 23 to 97%! Thus, the potential variation in organ distribution from individual to individual is huge. Lung depositions may have even greater variations than in other organs depending on mode of exposure and the physical and chemical characteristics of inhaled particles. We have not found a means to take such individual distributional differences into account in making dose estimates. Thus, a standard calculational model, similar to that described in ICRP Publication 30 but using the average organ partitioning observed from autopsy data from former Los Alamos workers, is used to obtain "standard" values such as shown in Table 4.

Direct *in-vivo* measurements of whole-body and regional body radioactivity generally did not show activity above background, similar to results in previous examinations of this group. This is not particularly surprising because the 1944–1945 exposures were to highly purified ^{239}Pu with little Am or other radionuclides. With currently available methods, the minimum detectable activity of Pu by direct counting is high (see Table 2). Thus, this result is not viewed to be in conflict with the estimates derived by urine bioassay results.

A count of the right hand of Subject 1 showed 280 Bq Pu (7.5 ± 1.4 nCi). This activity is in the tip of his right index finger, the site of a Pu-contaminated wound in July 1944. This result is consistent with earlier measurements reported. There are no physical changes noted at the site of activity.

RESULTS OF MEDICAL STUDIES

All 22 living persons in this study were given comprehensive medical examinations at Los Alamos during the period from September 1986 through October 1987. The ages of these individuals as of the end of 1986 ranged from 61–78 y. The median age was 64 y.

The principal medical findings and health status of these individuals are listed in Table 5. The medical diagnoses are not unusual or unexpected for males above 60 y of age: degenerative joint disease (nine individuals); elevated blood pressure (eight); benign prostatic hypertrophy or chronic prostatitis (six); arteriosclerotic vascular disease in extremities (five); overweight (three); history of skin cancers (including one melanoma) (three); chronic obstructive lung disease in several smokers (three); and coronary artery disease or abnormal electrocardiogram (three). Other diagnoses include Paget's Disease of bone, cataracts, diabetes mellitus, and blindness from glaucoma, each of which was found only in one individual. Cancer was not known, diagnosed, or suspected in any person at the time of examination, except for the past history of skin cancer in three individuals.

Occupational histories on these men do not show significant change since the last two reports (Voelz et al. 1979, 1985). These men are either retired or in current jobs with little or no hazard potential.

Current smoking histories on these men are listed in Table 5. The lifetime cigarette smoking experience is expressed in terms of pack-years. A pack-year results from smoking one pack per day for a period of 1 y. Only two individuals (Subject 4 and 11) were active cigarette smokers at the time of their last examination. Twelve persons are former cigarette smokers; eight individuals have never smoked.

Sputum samples satisfactory for cell studies were obtained from 18 of the subjects. No malignant cells were identified in the samples. Inadequate volume of sputum and/or lack of cells were responsible for unsatisfactory tests for Subjects 18, 19, 24, and 25.

Chest x rays showed minor changes in five individuals, which were interpreted as chronic pulmonary fibrosis and emphysema changes. The small density nodule noted in Subject 3 in 1981 was not present this time. Subject 9 was found to have a nodular density and pleural plaque in his left lung, which may be residual scarring from pneumonia in 1985.

The bone x rays and dental x ray of the right upper first molar did not uncover new pathology. The bone changes associated with Paget's Disease in Subject 9 has not changed significantly in 5 y. Subjects 5, 11, and 13 have each had previously identified sclerotic "bone islands" visualized by x ray. These artifacts have not changed appreciably and are not considered to be significant findings.

The results of the special lymphocyte study have been published (Voelz et al. 1989). The ratios of T-helper (T_H) lymphocytes to T-suppressor (T_S) cells were elevated for 5 of 11 persons with Pu depositions above 500 Bq (13.5 nCi) compared with ratios in the control persons. These differences appeared to be due to a decrease in T_S lymphocytes as a result of altered radiosensitivity, which was demonstrated in cultured cells subjected to *in-vitro* x-ray radiation. The significance of these findings is unknown. Additional studies are needed.

MORTALITY

Four persons in this group of 26 Pu workers had died by the end of 1986. Of these four deaths, two occurred

Table 5. Summary of major medical findings, 1986–1987 examinations.

ID No.	Pu (Bq)	Age (1986)	Smoking history (1982–1986)	Medical events and tests since 1981	Medical diagnoses
1	1590	68	9 pack-years. Quit cigarettes in 1984; 6–8 cigars per day.	Old fibrotic changes and punctate calcifications in chest x ray.	Recurrent bursitis left shoulder. Slight osteoarthritis in hips and spine.
2	270	65	25 pack-years. Quit cigarettes in 1972; smokes 7–8 cigars per day.	Gall bladder resection, 1984.	Mild obstructive lung disease. Hamartoma resection, right lung, 1971.
3	2550	64	91 pack-years. Quit cigarettes in 1986.	Cholesterol = 262 (N = 120–250).	Mild chronic obstructive lung disease, chronic bronchitis, borderline hypertension.
4	2150	66	50 pack-years. One-half pack per day and pipe smoker.	BUN = 35 (N = 8–24); creatinine = 2.1 (N = 0.5–1.5); uric acid = 9.7 (N = 3.9–9).	Mild hypertension being treated. Osteoarthritis of spine and hips. History of benign colon polyps. Retinal hemorrhage, 1980.
5	1630	68	Never	Cataract surgery, 1984.	Hypertension being treated. Slight benign prostatic hypertrophy.
6	1590	66	38 pack-years. Quit cigarettes in 1971; quit cigars in 1977.	Cholesterol = 258 (N = 120–250).	Rectal polyps removed, 1979.
7	3180	78	Never	Cataract surgery, 1985; potassium = 5.5 (N = 3.4–5.2); SGOT = 43 (N = 8–36).	Prostatectomy, 1979; benign prostatic hypertrophy.
8	1780	63	Never	Potassium = 3.0 (N = 3.4–5.2); uric acid = 10 (N = 3.9–9.0); cholesterol = 253 (N = 120–250); triglycerides = 196 (N = 30–170).	Hypertension being treated; overweight.
9	2000	71	27 pack-years. Quit cigarettes in 1982.	Pneumonia and urinary tract infection, 1985; alk. phosphatase, 320 mg dL^{-1} (N = 30–125).	Asymptomatic Paget's Disease in pelvic bones; hypertension; overweight; auto accident (1979), head and neck injuries.
11	480	64	74 pack-years. 1.5–2 packs per day since age 13.	Degenerative joint disease in cervical spine.	Diabetes mellitus since 1975. Chronic bronchitis; chronic obstructive pulmonary disease.
12	560	75	Never	Skin cancers removed from forehead; degenerative joint disease in hips.	Hemorrhoids. Varicose veins in legs. Previous skin cancers on left hand, right cheek. History of hiatal hernia and duodenal ulcer.
13	52	69	6 pack-years. Quit cigarettes in 1972.	Malaria, 1985; cholesterol = 272 (N = 120–250); x-ray "bone island" density in ileum increased slightly since 1982.	Malignant melanoma on skin of anterior chest, excised 1971. Benign prostatic hypertrophy.
17	1260	64	36 pack-years. Quit cigarettes in 1976.	None	Acute gout, 1966.
18	1110	62	Pipe smoker for 30 y, stopped in 1985.	Coronary angioplasty, 1985; ECG—1° AV block and left ventricular strain.	Hypertension, under treatment.
19	410	62	Never	Abnormal electrocardiogram, right bundle branch block.	Normal
20	480	63	Never	None	Blind from glaucoma, bilateral (1968); benign prostatic hypertrophy.
21	370	61	26 pack-years. Quit cigarettes in 1972. Pipe and cigars for 19 y; quit in 1982.	Cholesterol = 269 (N = 120–250); triglycerides = 210 (N = 30–170).	Benign prostatic hypertrophy; moderately overweight.
22	290	62	30 pack-years. Quit cigarettes in 1956. Smoked pipe for 26 y; quit in 1980.	Hypothyroidism under treatment since 1985.	Hearing loss at high frequencies.
23	310	61	Never	None	Normal
24	370	62	Never	None	Chronic prostatitis; kidney stones 1965, 1983, 1985; mild hypertension.
25	180	68	43 pack-years. Quit cigarettes in 1980. Smoked pipe for 5 y; quit in 1969.	X ray showed arterial calcification in legs.	Myocardial infarctions, 1979, 1980; coronary bypass surgery, 1980; skin cancers (two)—resected from face.
26	110	63	30 pack-years. Quit cigarettes in 1967. Smoked pipe for 31 y; quit in 1974.	Cholesterol = 307 (N = 120–250).	Hypertension under treatment; atherosclerotic artery disease, iliac and femoral arteries; degenerative joint disease, hips and knee.

during the 5-y interval between the 1981–1982 examinations (Voelz et al. 1985) and the 1986–1987 study.

Subject 27 died in December 1982 at age 62 from respiratory failure associated with pneumonia and complications of congestive heart failure, multiple pulmonary emboli, and multifocal hemorrhagic pulmonary infarctions. He had generalized atherosclerosis with marked occlusions of the left circumflex and left anterior descending coronary arteries. The medical findings previously documented in this study series (Hempelmann et al. 1973; Voelz et al. 1979, 1985) indicated the presence of atherosclerotic coronary artery disease with myocardial infarctions in 1968 and 1976.

Subject 10 died in January 1985 at age 71 of lung cancer. In earlier years of the study, chest x rays showed a few nodular changes suggestive of sarcoidosis in both upper lungs. These findings regressed gradually after 1968. In 1982, his pulmonary ventilation tests were consistent with a diagnosis of chronic obstructive pulmonary disease, which we attributed to cigarette smoking. Lung cell cytology was normal. In 1982 he reported smoking one-half pack per day, but he has had a history of 1+ packs per day throughout most of his adult life.

Standardized mortality ratios (SMR) were calculated from the mortality experience of these Pu-exposed workers and the expected deaths based on mortality rates, age and calendar-year adjusted, of white males in the U.S. population using the Monson program (Monson 1974). The end of study date was the end of 1986. A summary of this analysis is given in Table 6.

An analysis was also made to compare the mortality rate of these Pu-exposed workers with 876 contemporary unexposed Los Alamos workers. Subject 10 was included as deceased in the Pu-exposed workers, although his death actually occurred after the end of 1983, which was the end of study. The maximum likelihood estimate of the risk ratio for all causes of death was 0.69 (approximate 95% confidence limits = 0.25, 1.9) and for deaths from all cancers was 0.82 (CL = 0.11, 6.1). A risk ratio of less than one indicates the risk of death in the exposed group is less than in the unexposed. In this study, the confidence limits for both estimates encompass one, which indicates no statistical difference is discernible between the mortality in exposed and unexposed groups.

Table 6. Standardized mortality ratios of Manhattan Project Pu workers based on mortality of U.S. white males through 1986. Average year of entry = 1944.9; average age of entry = 24.1; total person-years of survival = 1048.

	Observed	Expected	SMR	CI[a]
All causes of death	4	9.86	0.41	0.11, 1.04
All malignant neoplasms	1	2.21	0.45	0.01, 2.52
All diseases of circulatory system	1	4.67	0.21	0.00, 1.19
All respiratory diseases	1	0.55	1.81	0.02, 10.04
All external causes	1	1.10	0.91	0.01, 5.07

[a] 95% approximate confidence intervals.

Three of the former Manhattan Project Pu workers have died since the completion of the 1986–1987 clinical examinations. The medical histories for these individuals subsequent to our last examinations are summarized below.

Subject 25 developed symptoms of pain and stiffness of his neck in spring 1988. Chest x rays and a CT scan identified a mass in his chest. In June 1988, the diagnosis of lung cancer was confirmed by bronchoscopy and biopsy. He had a past medical history of myocardial infarctions in 1979 and 1980. His heart disease was treated with a coronary bypass procedure in 1980. Since then, he had been free of symptoms from his heart disease. He had a 43 pack-year history of cigarette smoking, but had quit at the time of his surgery in 1980. Although terminally ill from lung cancer, his underlying cause of death was listed on the death certificate as severe arteriosclerotic heart disease. The rapid nature of his demise in November 1988 was attributed to congestive heart failure. He was 70 y of age at the time of death.

Subject 3 died in June 1989 at age 66 of a "large cell poorly differentiated carcinoma" with extensive metastases. The autopsy report indicated that the most likely site of origin was the lung. His recent medical history included a diagnosis of prostate cancer that was treated by surgery and radiation treatments from June to November 1988. Follow-up tests suggested, however, that this disease was controlled. He was a heavy smoker and we have regularly reported findings of mild to marked atypical lung cell cytology. In 1971, one pathologist described these cellular changes as being significant and "premalignant" (Hempelmann et al. 1973).

Subject 20 began having pain in his lower back in November 1988. X rays of his lower back identified a bone tumor of the sacrum. An x ray of the sacrum was normal on our 1986 examination. A biopsy of the tumor in February 1989 indicated it was an osteosarcoma. He died of his disease at age 66 in May 1990.

Table 7 lists the seven persons of the 26 Manhattan Project Pu workers who have died as of October 1990. In the column marked "Pu End" are the estimated Pu depositions for each deceased person at the time of death. The estimates are made either by urine excretion data or, if available, by Pu measurements in postmortem tissue samples extrapolated to a whole-body deposition. A second column, "Max," lists the highest deposition estimate for any year calculated by urine excretion data using the PUQFUA3 program. A comparison of the two values gives some idea of the range of Pu deposition estimates over the long time periods since exposure.

The maximum deposition estimates ("Max") are frequently recorded within 1 or 2 y after exposure, but for other persons the maximum estimates occur many years later. The time delay in reaching maximum urinary excretion values is presumably related to particle size and chemical solubility properties of the inhaled Pu. The maximum deposition estimates for all persons in this study range from a low of 110 Bq (3 nCi) for Subject 13 up to 6960 Bq (188 nCi) for Subject 3. The median value

Table 7. Causes of death in seven of 26 Manhattan Project workers exposed to Pu in 1944–1945.

ID no.	Age at death	Year of death	Cause of death	Plutonium Bq (nCi)	
				End	Max[a]
15	36	1959	Myocardial infarction	370 (10)	590 (16)
16	52	1975	Auto/pedestrian accident[b]	670 (18)[c]	670 (18)
27	62	1982	Pneumonia/heart failure[b]	260 (7)[c]	780 (21)
10	71	1985	Lung cancer	520 (14)	1150 (31)
25	70	1988	Heart disease (lung cancer)[b]	150 (4)[c]	410 (11)
3	66	1989	Lung cancer[b]	2550 (69)	6960 (188)
20	66	1990	Bone cancer[b]	560 (15)[d]	740 (20)

[a] Highest deposition calculated by PUQFUA3 code in any year.

[b] Postmortem tissues collected for Pu measurements.

[c] Estimated by Pu tissue measurements.

[d] Value differs slightly from the 1987 estimate (Table 3) because of additional urine samples taken in 1989.

of the maximum deposition estimates is 980 Bq (26.5 nCi). The median of the residual depositions in 1987 is 500 Bq (13.5 nCi). A crude comparison suggests that for this study group, the average retention half-time of internally deposited Pu available to the circulation and kidney is about 40 y from the time of initial exposure. This finding is in reasonable agreement with the recommended 20-y retention half-time for Pu in liver and 50 in the skeleton (ICRP 1986).

Tissue samples for Pu measurements have been obtained from five of the seven deceased workers, including the person with the bone tumor. These measurements will determine the distribution of the Pu between the organs and will help in estimating organ doses. Results have been reported on Subject 16 (Voelz et al. 1979; McInroy et al. 1991) and Subject 27 (identified as Case 193 in Lynch et al. 1988; McInroy et al. 1989, 1991).

The distribution of Pu depositions at time of death or 1987 for the group of 26 workers is shown in Fig. 1. This figure shows that there has been only one death (11%) in nine persons with Pu depositions of over 740 Bq (20 nCi); by contrast, there are six deaths (38%) in 16 persons with less than 740 Bq (20 nCi) Pu deposition. This distribution of deaths is probably not significant nor is it attributable to their ages because the latter group is somewhat younger on average than the former.

DISCUSSION

This unique group of 26 males, exposed to Pu in 1944 and 1945, have had 100% follow-up for 42 y by means of medical and radiological dosimetry examinations. The mortality experienced to date by members of the group for all causes of death is considerably less than expected from U.S. rates (SMR = 0.41, 95% CI = 0.11, 1.04). This finding is not statistically significant because of the wide confidence intervals that result from the small number of subjects, but it is still impressive that a large "healthy worker effect" has continued over a period of 42 y. Furthermore, comparison with their contemporary Los Alamos workers hired in 1944–1945 indicates the mortality rate is not increased in the Pu-exposed group. It is concluded that the mortality experience of these Pu-exposed men has not been excessive for the first 42 y after exposure.

Periodic clinical examinations have not revealed findings that are unusual or unexpected for men in their age group. The examinations at 5-y intervals have not detected the cancers that have caused deaths. No other cancer cases are known to have occurred in the group except for the previously reported skin cancers (Subjects 12 and 25) and a successfully treated malignant melanoma of the skin (Subject 13). Periodic medical examinations did detect the cardiovascular damage that ultimately became the underlying cause of death for two individuals. It is concluded that although the periodic medical examinations conducted for this study have been valuable for follow-up and research purposes, they probably have not had a significant influence on the health and mortality data for the group.

Lung cancer has been the most frequent malignancy in the group, as is generally expected for white males. Three cases in a group of 26 men over a 44-y period is a higher incidence than expected, but still within the limits of expectation. The finding is also consistent with the known added high risks from cigarette smoking in as much as all three men had long cigarette smoking histories. How much additional risk may have been imposed by their Pu inhalation cannot be discerned from these data.

Other studies of Pu-exposed workers have not demonstrated excesses of lung cancer. In 224 white male Pu-exposed workers, selected on the basis of each having a 1974 estimated Pu deposition in excess of 370 Bq (10 nCi), only one death from lung cancer occurred over a 33-y follow-up period (Voelz et al. 1983). The SMR for lung cancer based on U.S. rates was 0.2 (95% CI = 0, 1.1). A review of lung cancer occurring in the 82 smokers in the group did not demonstrate high Pu risks to smokers such as proposed by Gofman (1981). Gofman's risk estimate predicted that 9 to 13 excess lung cancers should have occurred in these smokers by 1980, but no lung cancers were observed. The study by Wilkinson et al. (1987) of workers at the Rocky Flats plant makes a comparison of mortality rate ratios between workers who have Pu

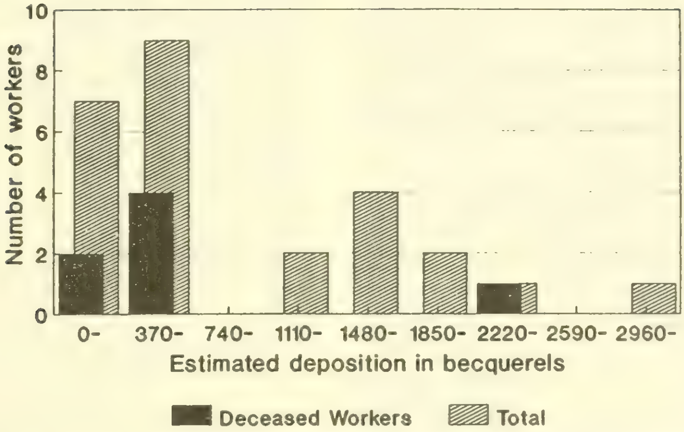

Fig. 1. Plutonium deposition distribution for 26 Manhattan Project workers as of 1987 or year of death.

depositions of 74 Bq (2 nCi) or more with unexposed workers (<74 Bq). The ratios of lung cancer rates for exposed and unexposed workers were not significantly different using cancer induction times of 2, 5, and 10 y. The analysis for the 10-y induction time calculated an elevated rate ratio of 1.4 (95% CI = 0.33, 4.5) based on only three lung cancer deaths. No smoking data were available to aid interpretation of the Rocky Flats mortality data.

In summary, an elevated risk of lung cancer has not yet been demonstrated in workers from occupational exposures to Pu. Morbidity studies of Pu workers to obtain cancer incidence rates, good occupational exposure data, and lifetime smoking histories are needed to explore this question more thoroughly.

The other cancer observed in this study is an osteogenic or bone sarcoma (Subject 20). To our knowledge, this case is the first in which a bone sarcoma has been reported in a person exposed to Pu. This man was a chemical operator in Pu purification and in Pu recovery work in 1945–1946. He had "consistently positive" counts of nasal swabs from July to September 1945 and from March to August 1946. Seven nose counts were considered "high," high being defined as over 50 counts per minute. In August 1945, he had an excision of a wound of his thumb contaminated with "Pu solution." The activity in the excised tissue was reported to be 1640 counts per minute.

Bone sarcomas are the most frequent radiation-induced cancer observed in persons with Ra depositions. Eighty-three subjects with bone tumors are listed in the Argonne National Laboratory Ra study population (Schlenker et al. 1989). The lowest average skeletal dose for any person in their study is 4.17 Gy from ^{226}Ra plus 0.39 Gy from ^{228}Ra.

Osteogenic sarcoma is also the predominant bone tumor resulting in dogs from ^{239}Pu injections (Thompson 1989). These tumors almost always originate in trabecular bone, usually in long bones or vertebrae, this distribution being especially pronounced at lower dose levels. A bone sarcoma and a head sinus carcinoma has occurred among the group of 20 beagles with the lowest average skeletal dose of 0.02 Gy (2 rad) from injected ^{239}Pu in the University of Utah studies (Mays et al. 1987; Mays 1988).

Bone tumors have been infrequently observed in beagles after inhalation of relatively insoluble $^{239}PuO_2$. Those that have occurred, however, have been in dogs with lower Pu exposures. In the Hanford Pu inhalation studies in beagles (Park et al. 1990), deaths from bone tumors occurred in two of 24 dogs in the lowest exposure group [i.e., an initial lung deposition from a single exposure comparable to about the maximum permissible lung dose (MPLD) in Pu workers]* and in one of 21 dogs in the next higher exposure group (about 8 MPLD). No bone tumors were observed in more highly exposed animals. The latter animals mostly died of radiation pneumonitis or lung cancers. No bone tumors occurred in the 20 unexposed control animals.

After inhalation of soluble $^{239}Pu(NO_3)_4$, bone tumors were observed in 41% of the more highly exposed beagles to date (Dagle et al. 1990). With one exception, these animals were in groups with exposures of 150 MPLD or more. The exception is a dog that died of a bone tumor in the group of 20 dogs exposed to about 25 MPLD. To date, no bone tumors have been observed in dogs with lesser exposure, but many of them are still under study.

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* For ease of comparison with Pu measurements in workers, the average initial lung depositions in the experimental dog groups are expressed in approximate units of maximum permissible lung dose for workers.

The incidence of bone cancer in man is ordinarily low. In a group of 26 adult males over a 40+ year period, the likelihood of observing such a case is only about 1%.

The site of origin of this tumor in the sacrum is noteworthy. This anatomical location is an unusual site for a bone sarcoma. Schlenker et al. (1989) found that the axial skeleton (head, vertebrae, sacrum/pelvis, ribs, sternum) was the site of tumor for only 13% bone sarcomas occurring naturally in males and, similarly, 17% in females. The bone tumor sites in dogs after $^{239}PuO_2$ or $^{239}Pu(NO_3)_4$ inhalation exposure have a much different distribution. For those bone tumors in which the tumor sites are described in the literature, 19 of 24 tumors (79%) in Pu-exposed dogs are located in the axial skeleton (Park et al. 1990; Dagle et al. 1990). In another series, 22 of 29 bone tumors (76%) occurred in the axial skeleton in dogs injected with ^{239}Pu as young or mature adults (Bruenger et al. 1990). It should be noted that the distribution of bone tumors in dogs may differ from that in man. For example, after ^{226}Ra injection of adult dogs, 11 of 26 bone tumors (44%) occurred in the axial skeleton (Bruenger et al. 1990), whereas in man the anatomical distribution of bone tumors in Ra-exposed persons is not significantly different from the natural bone tumor distribution; i.e., about 15% of tumors occur in the axial skeleton (Schlenker et al. 1989).

The latent period from exposure (1945) until clinical appearance of the bone tumor (1988) in this series is 43 y, much longer than the 13-y mean survival period for dogs in unexposed and low exposure groups. Whether this difference in life span and length of radiation exposure will be an important factor in the Pu risk to man is unknown. This particular study group has the longest period of follow-up of all Pu worker studies to date, and the bone tumor finding illustrates the importance of the length of follow-up for internal α emitters with long effective half-times.

The estimated Pu deposition in this man at the time of death is 560 Bq (15 nCi). The cumulative dose to the surfaces of bone is estimated to be 0.44 Gy (44 rad) through the end of 1986, 2 y prior to the appearance of the tumor. Marshall et al. (1978) calculated a relative distribution factor (RDF) for bone doses of ^{239}Pu vs. ^{226}Ra of about 28 for a surface source of Pu and 0.96 for a volume source. Dividing the 0.44 Gy surface bone dose by an RDF of 28 gives an average skeletal (volume) dose of 0.016 Gy. This estimate is comparable to the 0.02 Gy average skeletal dose in the lowest dose Pu-injected beagle that has been observed with a bone tumor. The lowest average skeletal bone dose in any Ra-exposed person acquiring bone sarcoma is 0.85 Gy, which was reported by Mays (1988) for a British dial painter. Although this initial dose estimate for our case is subject to potential large error, the result is similar to the lowest range of doses for dogs that have developed bone tumors when exposed to Pu either by injection or by inhalation, but is much below the dose for the lowest Ra-exposed person with a bone tumor. The dose in this Pu-exposed man is estimated to be below current radiation protection guidelines.

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Mr. MYERS. We appreciate it.

Dr. Teller, we kept you much longer than we promised you. You know these campaign promises we make, we tried to get you out of here quickly. But we certainly appreciated your testimony today. You have given us the kind of answers, maybe not the answer we specifically were requesting, but you have hit the areas that we have got to answer this year and in the coming years. And that is the reason we wanted you to be here for sure.

We have a fine panel following you here, but realize you have a busy schedule also. But we, on behalf of the committee, we appreciate very much your testimony and we will all be sending you—maybe we better not say fax, we better mail them. Might keep your fax machine busy some afternoon, all the questions we probably are going to have.

Dr. TELLER. I realize that I am now owing you one report from Los Alamos, and possibly from work in Los Alamos, and possibly additional answers if there are more questions.

Mr. MYERS. Well, there will be a lot of questions coming. And we appreciate very much your contribution through the years. It has been expressed here by every Member of this panel, and we thank you so much for coming here today. Thank you. Have a safe trip back.

The committee will now be pleased to hear from the next three witnesses, if you would like to come to the table. Dr. Teller, if you would have time to stay, we would be welcome to keep you.

John, Mr. Conway, will you come up and join us here? I thought maybe you didn't want to associate with us.

Mr. CONWAY. I thought Fred needed assistance. That is why he had somebody next to him.

Mr. MYERS. Right down the list here, maybe not in any order, but Dr. Happer, I think, is no stranger to this committee, has appeared before our committee. He is a professor in physics at Princeton, who has a long interest in the advanced physics.

So we appreciate very much your testimony this afternoon, and thank you. Your entire statement will become part of the record.

The committee will hear you now, Dr. Happer.

OPENING STATEMENT OF DR. WILLIAM HAPPER

Dr. HAPPER. Thank you very much, Chairman Myers.

With your permission, I thought I would summarize my prepared statement.

Just as a word of introduction, I have had a lot of interaction with the Department of Energy. Under Admiral Watkins, I served as the Director of the Office of Energy Research, and Science and Technology Advisor to the Secretary. And I also served for several months under Secretary O'Leary. So I had a good opportunity to see the Department of Energy in action.

I gather from reading some of the testimony from your hearings last week, there has been a lot of discussion about reorganizing the Department, perhaps even abolishing the Department. And as I read this, as I said in my statement, I am reminded of Abraham's negotiations with God about the future of Sodom. And so I thought I would begin by quoting from the Bible about this negotiation. And here is what it says.

> And the Lord said, Because the cry of Sodom and Gomorrah is great and because their sin is very grievous: I will go down now and see whether they have done altogether according to the cry of it. And Abraham drew here near and said, Wilt thou also destroy the righteous with the wicked? Peradventure, there be fifty righteous within the city: Wilt thou spare the place for the fifty righteous that are therein? That be far from thee to do after this matter, to slay the righteous with the wicked. Shall not the judge of all the earth do right? And the Lord said, If I find in Sodom fifty righteous within the city, I will spare all the place for their sakes.

So now, it is true the Department of Energy is a human institution, and it obviously could be better. But it has a lot more than fifty righteous people in it. And so I hope the committee and your colleagues in the Congress will keep that in mind before you send it off to join Sodom and Gomorrah.

Well, there are within the Department of Energy certain activities that really have to be preserved. There are things that this government ought to be doing, whether there is a Department of Energy or not.

So I would like to review a few of them. And one which was touched on very eloquently by Dr. Teller, and it is certainly a very hard act to follow Dr. Teller, but that is the weapons business. And this is the outgrowth of the old Atomic Energy Commission from World War II.

We are all very, very pleased that tensions in the world have been tremendously reduced, and I agree with Dr. Teller largely because of the firm position that the United States has maintained all of these years. Nevertheless, there is great danger. There are still nuclear weapons all over the place. And we need someone really competent to look after them. And so that part of the DOE activities, the part that was alluded to by Dr. Teller, needs to be preserved.

One of the things that I worry tremendously about is because DOE weapons laboratories are getting such a bad press, it may be difficult to recruit the best people. And we really cannot afford to be running these laboratories with, you know, C students and B students from engineering and science schools.

ASSETS OF THE NATIONAL LABS

I think one of the hallmarks of Livermore and Los Alamos in the past is they have had world-class scientists, really the cream of the crop, or at least a fraction of it would go there. We want to be sure that that continues, as long as we have to worry about nuclear weapons. And so somehow the laboratories have to be given interesting enough work that they can recruit the new generations of scientists and engineers that will be needed, at least for the next few years.

Let me turn now to basic research. That was really my portfolio in the Department of Energy, so I feel very keenly responsible for it. And for historical reasons, the DOE has supported a very large amount of research, in fact, most of the high energy research and a good portion of nuclear physics research, but also things like the human genome project, global change, material science. In fact, the budget is quite comparable to the NSF budget. And a good fraction of the engineers and scientists in this country have been trained at DOE, either through fellowships or by work at the laboratories, the DOE laboratories.

I personally had a summer job when I was undergraduate at Oak Ridge, and it really made the difference for me. That is why I went into science was, it was so interesting, that I just decided I wanted to do that. And many, many people like me have had that experience.

Perhaps the most unique contribution of DOE to the research base of this country is its maintenance of large facilities. Here I am thinking about accelerators, thinking of synchrotron light sources, neutron sources, electron microscopes, things that are so big and so expensive, such a big team to run them, that you really can't run them at a university. And I don't know of any other agency in the government that maintains facilities like that. So somehow these need to be preserved. And it is very difficult to preserve basic research.

If DOE is reorganized, I could easily see a lot of this key basic research disappearing in the chaos that follows. It is something that has no obvious defenders. And I am pleading for that not so much for the researchers, because I come from that community, but for I think the good of the United States.

I think if you look at the prosperity of this country now, thing after thing after thing has come from basic research done 30 years ago, 40 years ago, 50 years ago, everything from transistors to lasers to microwave ovens, all of the things that we take for granted today have come after a long gestation period from basic research.

RISK ASSESSMENT

Let me mention another type of research that is done uniquely by DOE, and its contractors, and that is risk assessment. And this touches on another point of Dr. Teller's, that we are spending a very large amount of money not just in DOE but all across this country worrying about risks, some of which are real and some of which are, you know, really negligible.

One of my friends at the Department of Energy used to say that if you are surrounded by rattlesnakes, you should shoot the ones at your ankles first and not worry about the ones on the neighboring ridges, and yet we are firing away in all directions, shooting the snake a hundred miles away that is not likely to harm us, while something is biting on our ankles.

And so risk assessment would allow us to determine which ones really have to be taken care of first, and DOE I think has done one of the best jobs there. They unfortunately have not applied that assessment to their own cleanup program as well as one would have hoped.

Finally, there is the issue of disposal of nuclear wastes. I think if fission power is ever to have a future or even if we are going to be able to cope with the wastes of what we already have, from the commercial sector, something has to be done with waste disposal. I don't know who is going to do that, if it is not DOE or something coming out of DOE. It is not going to be done by the Environmental Protection Agency.

Now, I have a few comments on how I think DOE could work better. When I was at DOE, the thing that struck me was the huge numbers of people that we had. My feeling is that DOE is overstaffed. And it was, you know, people liked to do something, don't want to sit on their hands, so they get busy and they write memos to each other and they write reports and they have task forces and they oversee people, and overseers oversee overseers, and it really gets very hard if you are the Indian, you know, at the pointy end of the spear trying to do something useful, you know, with all these managers behind you, to get anything done.

And so I know DOE particularly well. I think that most of the Federal Government has the same problem. And if I were king at DOE, I would certainly look into cutting the staff.

GOVERNMENT CONTRACTORS

One place where you see the effects of that very clearly is in the whole GOCO concept. You know DOE has used contractors to do most of its research, to run its laboratories, quite different from other Federal agencies. And in my view, that has worked very, very well, especially with the laboratories.

Dr. Teller's laboratory at Livermore, for example, is run by the University of California, as is Los Alamos. Sandia was run for years by AT&T; it is now run by Martin-Marietta, which also runs Oak Ridge. And my own university, Princeton, operates the Plasma Physics Laboratory for the Department of Energy.

However, as the years have passed, this concept has become more and more difficult because of the demands for control. And I think the problem here is that various people in Washington, including some of your congressional colleagues here in Congress, various Inspectors General, General Accounting Office, are always looking for ways to make headlines. And so an easy way to make headlines is to investigate a DOE laboratory, or facility, find out that, you know, there is some alleged scandal, and then everyone is embarrassed and what happens is a lot of new people get hired to oversee this deficiency. There will be another report, other people get hired to oversee something else.

Well, in many cases the scandals are pretty trivial. I heard a description of a hearing in which someone from a DOE contractor pointed out that to save an additional dollar in looking after inventory would cost two dollars, and the response from the table was even one dollar of taxpayers' money lost is too many, even if it costs $2 to save it.

So no company, no private company can operate the way we try to operate our laboratories. So something has to be done about this crazy oversight that is strangling our GOCO laboratories. You just can't manage them with a lot of petty CEOs from Washington.

Finally, I would say that DOE in my view is a very inbred organization. It is very hard to get people from the outside into DOE. And something ought to be done to let it—to let people come in from industry more easily, to let people come in from universities more easily, spend a few years, and go home.

That is something that was done I think with great success at the National Science Foundation, which my friend Fred can tell you about. We don't do it nearly as well in the Department of Energy. And part of that is this whole issue of conflict of interest. You know, what people have to give up now in terms of conflict of interest is so burdensome that you almost can't get them to come.

I know when I was at DOE I tried very hard to get leading people from industry to come in and help manage our science programs, especially the engineering-related programs. So people who had had experience in the cruel world where you have to make a profit and meet a payroll, to come in and help us, they could not do it because of everything they had to give up. So there are some problems that you could help with.

SUPPORT OF BASIC RESEARCH BY FEDERAL GOVERNMENT

Well, I think at this point I would like to summarize with just three points that I have touched on. And let me remind you again that basic research really has to be supported by the Federal Government if we want the magnitude or anything close to the magnitude that we are used to. The universities can't do it. The universities do not have the financial base to support basic research. The payback period is much too long and the question of ownership of intellectual property is much too uncertain for a private industry to support basic research.

You put a lot of money into basic research if you are a GE or the telephone company, and you never know who is going to benefit because the benefit comes 15 years, 30 years down the road. You spent all your stockholders' money, and you have got nothing to show for it.

I think our Founding Fathers recognized the importance of long-term investments in the various land purchases they made for this country. For example, the Louisiana Purchase, there was some skepticism about whether that was a good thing to do. But the moment it was purchased, the first thing they did was to get an appropriation from Congress to do some basic research on it. That was the Lewis and Clark Expedition, went out, you know, explored it. It took a long time for there to be a payback, but there was an enormous payback. And that was repeated time and again by our predecessors in this country. I think we can still do that, but in the research frontier; there is no more geographical frontier.

The second point has been mentioned already, and that is defense. We have an obligation to the defense of this country. The nuclear part of that is very special. Its home is now in the DOE. That has to be looked after. I don't think I need to elaborate further on that.

And the final point is education, and that is if you have an educated, industrious population, there is absolutely no way that anybody can beat you. I mean, what is it that makes Japan so formidable? It is the fact that they have industrious, intelligent, eager people. They have no resources. They really have nothing going for them, earthquakes shake them down every week or two, and yet they do extremely well. There are plenty of countries with much better resources that do worse.

So that investment in people is something that has to come from the Federal Government. And you cannot train scientists and engineers the way you train, you know, classical Latin scholars. It just costs too much. So the Federal Government has a role there. Universities cannot train scientists and engineers.

So, Mr. Chairman, thank you very much. That concludes my remarks.

[The statement of Dr. Happer follows:]

Testimony of William Happer
Professor of Physics
Princeton University

to the Subcommittee on Energy and Water Development
Congress of the United States
House of Representatives
January 31, 1995

Chairman Myers and members of the subcommittee, I am William Happer, currently a Professor of Physics at Princeton University. From 1991 to 1993 I served as the Director of the Office of Energy Research in the Department of Energy under Secretary of Energy Admiral James Watkins, and for a few months under Secretary of Energy Hazel O'Leary. While in that position, I was responsible for much of the non-weapons research at the Department of Energy. I supervised a budget of about $ 3 billion. I also served as Science and Technology Advisor to Secretary Watkins. In both capacities I had a good opportunity to see the Department of Energy in action.

I gather there has been much talk here in Washington about reorganizing and perhaps even abolishing the Department of Energy. I am reminded of Abraham's negotiations with God about the future of Sodom. As we read in the Bible:

" And the Lord said, Because the cry of Sodom and Gomorrah is great, and because their sin is very grievous: I will go down now, and see whether they have done altogether according to the cry of it, ... And Abraham drew near, and said, Wilt thou also destroy the righteous with the wicked? Peradventure, there be fifty righteous within the city: wilt thou also destroy and not spare the place for the fifty righteous that are therein? That be far from thee to do after this manner, to slay the righteous with the wicked. ... Shall not the Judge of all the earth do right? And the Lord said, If I find in Sodom fifty righteous within the city, then I will spare all the place for their sakes."

It is true that the Department of Energy, like most human institutions, could be a much better organization than it is, but I can testify that the Department and its contractors have far more than fifty righteous people. We should think carefully before we send DOE off to join Sodom and Gomorrah. In these prepared remarks, I have outlined some of my observations of DOE, and I will expand on some of these issues in my verbal testimony.

What DOE Activities Should be Preserved

There are activities in the Department that are vital for the United States and must be protected, whatever is done with DOE. Here are some of the most important ones.

Nuclear Weapons: Within the Department of Energy is the old Atomic Energy Commission, which was set up to produce nuclear weapons after World War II and to promote peaceful uses of nuclear energy. Although great progress has been made to reduce the numbers of nuclear weapons held by the United States and the former Soviet Union, there are still many weapons around, and there is a growing threat of nuclear proliferation to other countries, often hostile to the United States and its allies. This core nuclear weapons capability, now residing in Defense Programs of the Department of Energy, must be maintained as a vital interest of the United States. Intelligence about nuclear proliferation will be increasingly important in the coming years, and it is hard to imagine how we could get adequate intelligence assessments without the the assets of the core nuclear weapons program at DOE.

An important issue for the future is how to recruit and retain an adequate number of the best technical minds for these activities. We cannot afford to have Larry, Moe and Curly responsible for our nuclear weapons and related intelligence activities. The Assistant Secretary for Defense Programs at the DOE, Dr. Vic Reis, is trying to maintain quality through an imaginative program called Science Based Stockpile Stewardship.

Basic Research. The Office of Energy Research at DOE supports about the same amount of basic research as the National Science Foundation. For historical reasons, the DOE has supported almost all high energy physics research and three quarters of the nuclear physics research in the United States. It has also been a major player in many other areas of research, including the human genome program, climate change research, and materials science. A good fraction of the scientists and engineers of this country have been trained at DOE laboratories or at universities with DOE funds. Perhaps the most unique contribution of DOE to the research base of the United States is its maintenance of large research facilities like synchrotron light sources, neutron sources, particle accelerators, etc.

Basic research is always difficult to defend in times of constrained budgets, and much of the basic research funded by DOE could easily be cut adrift by a hasty reorganization of the Department. I am persuaded that basic research is vital to our future. In the short run, the loss of DOE funds for basic research would be devastating for the research community, and in the long run, the loss would be devastating for the US economy.

Risk Assessment. A special kind of research done by the DOE and its contractors is risk assessment. The United States cannot afford to respond with equal vigor to every suspected risk. Yet we have laws requiring communities to respond at great cost to risks of no real significance. As one of my friends at DOE used to put it, if you are surrounded by rattlesnakes, you should shoot the ones at your ankles first. Instead, we use all of our ammunition firing at rattlesnakes on the next ridge, while the ones at our ankles bite away.

Research done by the DOE and its contractors has been very useful in bringing some sound science to risk assessment and management – for example, the risks from naturally occurring radon, fluoride in drinking water, the risk of exposure to 60 cycle magnetic fields from household currents and the risks of exposure to solar ultraviolet radiation. It is unfortunate that DOE has not been particularly successful in using risk assessment to cope with the its own cleanup problem.

Safe Disposal of Nuclear Waste. Because of its military and civilian nuclear programs over the past fifty years, the United States has a legacy of nuclear waste that must be safely disposed of. While I think the problems here are more political than technical, there are important scientific and engineering issues which can best be addressed by DOE and its contractors.

How DOE Could Work Better.

Too Many People. In my view, the Department of Energy has too many people to function effectively. Private industry has been downsizing steadily in the past few years, but the Department of Energy has continued to grow. Much of the pressure for growth came from the Congress of the United States, various Inspector Generals and the General Accounting Office. A sure way to get press exposure is to investigate some aspect of a federal agency and issue a shocking report. The response most agencies is to add more and more federal employees to make it harder for outsiders to produce a successful exposé. Many of the problems I mention below would be ameliorated if the number of DOE employees were reduced, but this will not be possible without the help of the Congress in limiting grandstanding investigations.

Because of its history as an independent, secretive weapons agency, the DOE duplicates many functions that other agencies could perform, for example, OSHA for worker safety and health or the Nuclear Regulatory Commission for some of the nuclear-related issues. If external oversight agencies were used, there would have to be some provision to protect legitimate security needs of the weapons-related functions of DOE.

GOCO Concept. More than most other federal agencies, the DOE has used government-owned, contractor-operated or GOCO facilities. While there have been some problems with GOCO production facilities, the DOE National Laboratories have worked quite well under this arrangement. For example the two weapons Laboratories at Livermore, California and at Los Alamos, New Mexico, are operated for the Department of Energy by the University of California. My own Princeton University operates the Plasma Physics Laboratory for the DOE, and the Martin Marietta Corporation operates the Sandia and Oak Ridge National Laboratories.

However, as the years have passed, layer upon layer of bureaucracy has built up within the Department of Energy to oversee GOCO laboratories. In self defense, the GOCO laboratories have built up corresponding layers of internal bureaucracy to cope with the DOE demands. Much of the flexibility of the GOCO laboratories, which made them so attractive in the past, has been lost in the process. I am very much in favor of accountability from DOE's GOCO operations, but I think the most effective way to do this is to let the contractors manage, reward them if they succeed and fire them if they do not. Trying to manage with lots of petty Washington CEO's is not an efficient strategy.

More interchange of personnel from outside of DOE. One of the problems I saw at DOE was serious inbreeding. For a high-technology organization, the DOE had surprising little interchange of personnel with private industry or even other parts of the government. Here I think the DOE could profitably emulate the National Science Foundation (NSF), which has traditionally managed their research and educational programs with lots of "rotators," that is, people who come in for a few years from academia or industry, work at NSF, and the return to the private sector. Today, many people spend entire careers within the DOE, moving up from job to job, without ever having been exposed to the outside world.

Biographical Information **January 1995**

DR. WILLIAM HAPPER

Dr. William Happer, a Professor in the Department of Physics at Princeton University, is a specialist in modern optics, optical and radiofrequency spectroscopy of atoms and molecules, and spin-polarized atoms and nuclei.

Born July 27, 1939 in Vellore, India, Dr. Happer's parents were Lt. Col. William Happer, a Scottish physician in the Indian Army, and Dr. Gladys Morgan Happer, a medical missionary from North Carolina. He received a B.S. degree in Physics from the University of North Carolina in 1960 and the PhD degree in Physics from Princeton University in 1964. While at the University of North Carolina he held a Morehead Scholarship and a National Merit Scholarship, and he held a National Science Foundation Fellowship, a Woodrow Wilson Fellowship, and a Queen Fellowship during his graduate education at Princeton University.

In 1964 he went to Columbia University to take a position as Research Associate in the Columbia Radiation Laboratory. During his stay at Columbia he served as Instructor, Assistant Professor and Professor in the Department of Physics. He also served as Co-Director of the Columbia Radiation Laboratory from 1971 to 1976 and as Director from 1976 to 1979. In 1980 he joined the faculty at Princeton University. He was awarded the Class of 1909 Professorship of Physics at Princeton in 1988. On August 5, 1991 he was appointed Director of Energy Research in the Department of Energy by President George Bush with the consent of the Senate. While serving in that capacity, he oversaw a basic research budget of some $3 billion, which included much of the federal funding for high energy and nuclear physics, materials science, magnetic confinement fusion, environmental science, the human genome project, and other areas. He was asked to remain until May 31, 1993 to help the Clinton Administration during the transition period. He was reappointed Professor of Physics at Princeton University on June 1, 1993.

He has maintained an interest in applied physics as well as basic physics, and he has served as a scientific consultant to numerous firms and government agencies. From 1987 to 1990 he served as Chairman of the Steering Committee of JASON, a group of mostly academic scientists and engineers who advise agencies of the Federal Government on matters of defense, intelligence, energy policy and other technical problems. He is a trustee of the MITRE Corporation, and a co-owner of Magnetic Imaging Technologies Incorporated (MITI), a small company specializing in the use of laser polarized noble gases for magnetic resonance imaging and in magnetic resonance microscopy.

He has published over 100 scientific papers in The Physical Review,The Physical Review Letters, The Reviews of Modern Physics, and other journals. He is a Fellow of the American Physical Society and the American Association for the Advancement of Science. He held an Alfred P. Sloan Fellowship from 1966 until 1970, and in 1976 he spent six months at the Max Planck Institute for Laser Research in Garching, Germany with the aid of an Alexander von Humboldt Award.

Dr. Happer was married in 1967 to the former Barbara Jean Baker of Rahway, New Jersey. They have two children, James William, born June 11, 1968, and Gladys Anne, born May 6, 1971. The Happers live at 559 Riverside Drive in Princeton, New Jersey.

Mr. MYERS. Well, thank you, Dr. Happer.

I think we will wait until we hear all three for questions. Is that okay with everyone?

Well, our next panelist here is certainly no stranger to this committee. He is both a chemist as well as a physics professor. I think we have all first met him when he was Assistant Director, then later acting Director of the National Science Foundation, then came to Capitol Hill as a Senate staffer. Then our next experience I believe was with the Nuclear Regulatory Commission, where he served for five years—was it, Fred? And now is President of the Universities Research Association. So we are pleased to have back Dr. Bernthal.

OPENING STATEMENT OF DR. FREDRICK M. BERNTHAL

Dr. BERNTHAL. Thank you, Chairman Myers. And to you, Chairman Myers, and if I may, Chairman Bevill as well, following the current Chairman's lead, it is indeed a pleasure to return to testify before this subcommittee.

It has been about seven years, in fact, since I left the Nuclear Regulatory Commission and last spoke before this group. I have never worked in the Department of Energy, or its predecessor agencies, but in various positions over the last 16 years I have certainly had an opportunity to work with and observe the Department in many of its undertakings.

Since last July, of course, as you mentioned, Mr. Chairman, in my current post as President of the university consortium that has management and operating responsibility for DOE, I have enjoyed yet another perspective.

In my judgment, the most important of the issues the subcommittee will examine in this hearing and thereafter, already certainly alluded to by my friend Will, is the future of the DOE national laboratories. And I want to confine my formal remarks at least to this arena that is closest to my current responsibilities.

The organization I head, the Universities Research Association, as I am sure all of you know, is the M&O contractor for the Fermi National Accelerator Laboratory, and for the Superconducting Super Collider, the latter now in the final phases of its termination pursuant to congressional action in the fall of 1993.

I want to recount just a tiny bit of history of URA, because it touches on some points that I want to stress today.

Twenty-five universities agreed to form URA in 1965, as a consortium, with the broad following mandate: to acquire, plan, construct, and operate machines, laboratories and other facilities under contract with the government of the United States or otherwise, for research, development and education—I agree with Will's comments about education—in the physical and biological sciences, and to educate and train technical research and student personnel in said sciences.

Now, that was the purpose of my organization, which found its charter as an outgrowth of the actions of Dr. Frederick Seitz, who was then President of the National Academy of Sciences. And in the intervening years, URA has grown to comprise 80 universities, including nearly all of the Nation's leading research universities.

The reason I go through some of this, not as an advertisement, is that in my judgment the spirit and intellectual vitality of that kind of partnership between the government and the university research community, of which URA has been representative, not the only one to be sure, and from which the Nation has derived such great benefit over the years, needs to be revitalized and nurtured throughout the national laboratory system.

It certainly wasn't the first time in 1965 that the Nation turned to its distinguished research universities for assistance in constructing and leading a major national research endeavor. We all know the important, in fact pivotal, services that the University of California rendered through their national laboratories at Los Alamos, Livermore and Berkeley. And Argonne National Laboratory, another example, traces its roots to that era, and to the leadership of the University of Chicago and Enrico Fermi.

Mr. Chairman, I believe, as I indicated, the most important single issue on the agenda of America's research enterprise today—and I am speaking very broadly now—may well be the future of these and their sister national laboratories, where we have invested so much already.

So my message today is twofold. First of all, however the Department of Energy might eventually be structured to achieve the necessary economies that everyone is looking for in this time of fiscal constraint, it is essential that the capabilities embodied in the DOE national laboratories continue to be engaged in the Nation's research enterprise.

With many industries now cutting back or even eliminating their research programs, in fact, these DOE laboratories assume added significance and importance as national sources of new knowledge. Indeed, I suspect as the exigencies of the Cold War recede into history, the labs will remain for a long time seen as the most important investment the Department has made over the years.

It would surely be wasteful and short-sighted to permit those intellectual and capital resources now to be dissipated.

PARTNERSHIPS BETWEEN LABS AND UNIVERSITIES

The second point I want to make is that to maximize the return from these national assets, the historic partnership and synergy between the Nation's research universities and its national laboratories must be revitalized and strengthened. I have already spoken about that briefly. Just as that partnership was essential to the Nation in the years immediately following World War II, I would argue it remains essential today if we are going to optimize our utilization of the many resources available in the laboratories.

You know, the most remarkable national laboratory of all today is actually not contained in any single site. It is a virtual laboratory. And it now consists, in this era, as many other things do, in a way that is scattered across the country, encompassing the great universities in which we have invested so heavily, the last half of this century. DOE laboratories are part of that network.

But ironically, the university research endeavor is also now in troubled waters. It is confronted with a $10 billion—conservative estimate—$10 billion requirement for modernizing and updating its own research infrastructure and equipment.

Well, in these kinds of circumstances, and the problem has been recognized in three successive administrations, it is certainly reasonable to ask whether the enormous investment the country has made in research facilities and infrastructure at the national laboratories might offer a partial solution to that other problem. If the labs are as important now as I am arguing here, why change anything?

Well, quite simply, it is my belief the status quo isn't an option. And in fact none of my comments today should be understood to imply that major changes in laboratory governance, the way they are organized, and even the objectives that they have, are not possible or necessary.

I fear that if that doesn't happen, we may see a slow decline of those important facilities as we go through the next decade. In fact, the laboratories at issue here are relatively few in number. Each has its own unique character, and the one caveat I would offer is that if any prescriptive, systemic solutions, if I can put it that way, are offered, that should be approached with great caution. One size is not likely to fit all, because the labs are so different from one another.

So with that caveat, let me move to a few very specific suggestions. First of all, the primary mission of the Department of Energy's laboratories needs to be reaffirmed as a broadly defined, diverse research enterprise. In fact, over time I believe the laboratories should evolve to become truly national research centers, available to serve a variety of customers, if I can use that current terminology, in the Federal Government, in the States perhaps, and even in industry.

The research directions of those laboratories, therefore, should be determined by the marketplace of ideas and the needs of the country as defined by these various customers for that research.

Secondly, as part of the revitalized relationship between the laboratories and the Nation's universities, I believe a strong new governing structure should be devised for those laboratories. I think the laboratories should have a strong new governing structure and I would suggest that that begin perhaps at one or two laboratories on a pilot basis, governed by a corporate style board of directors composed of the leaders of the Nation's research universities and industries.

Thirdly, when it comes to environmental and occupational safety stewardship, the Department should simply require that its laboratories comply with existing law, as any university or industrial research community is already required to do. And I want to be very clear on this point, I am now talking particularly about the research laboratories as distinct from the larger problems of many of the so-called production-related facilities.

DOE needs to be freed from this regulatory spiral that seems to have reached the point where it is required in effect to maintain its own NRC, its own EPA, and its own occupational safety and health administration.

And fourthly and finally, the spirit of genuine delegation of responsibility by the department to its partners needs to be recaptured. Will has already spoken about this, so I won't detail it, but I certainly agree the department needs to reestablish in fact, not just in name, the principle of the government-owned contractor-operated, the so-called GOCO laboratory, in contrast to a system that has become for all practical purposes government-owned and government-operated.

Mr. Chairman, I think, as you know, I submitted a longer statement for the record. Let me just say in closing that the department, for its part, should come to judge performance on the basis of results, on the quality of research and scholarship at the national laboratories, as judged by a strong peer review system, they have that substantially in place, and on compliance with existing regulatory and other law.

In short, the Department should become the tough auditor and not the manager acting through a contractor surrogate. It is often easier to envision the desirable endpoint of this kind of transition than to figure out how to get there, but I hope a few of those ideas might help point the way.

Thank you very much.

[The statement of Dr. Bernthal follows:]

Testimony of

Dr. Frederick M. Bernthal
President, Universities Research Association
Washington, D.C.

before the

House Appropriations Subcommittee on Energy and Water Development
Rayburn House Office Building
January 31, 1995

FREDERICK M. BERNTHAL

President, Universities Research Association
Washington, D.C.

Fred Bernthal assumed the Presidency of Universities Research Association, Inc. (URA) in June of 1994. URA is a non-profit consortium of 80 major research universities, and is management and operations (M&O) contractor on behalf of the Department of Energy for the Fermi National Accelerator Laboratory (Fermilab) near Chicago. URA was the M&O contractor for the Superconducting Super Collider Laboratory (SSCL) near Dallas prior to the cancellation of that project by Congress in 1993, and continues to manage termination activities at the SSCL site. As President of URA, Dr. Bernthal is responsible for governance of the two laboratories, and for corporate relations with the Federal government, industry, academe, and the general public.

Prior to assuming his post at URA, Dr. Bernthal was appointed by the President in 1990 as Deputy Director of the National Science Foundation where he served four years, and twice as Acting Director, in 1990-91 and again in 1993. During that time, the Foundation's annual budget in support of U.S. science and engineering research and education grew steadily to more than $3 billion. He chaired the interagency Committee on Earth and Environmental Sciences of the Federal Coordinating Council for Science, Engineering and Technology (FCCSET) for three years, and he chaired the Second National Critical Technologies Panel which issued its report to the President in January, 1993.

Appointed by the President and confirmed by the Senate in 1988 to be Assistant Secretary of State for Oceans and International Environmental and Scientific Affairs, Bernthal served in that post for two years. He negotiated the U.S.-USSR Agreement for Cooperation in Basic Sciences and led numerous U.S. delegations to international meetings on environment, science, and technology issues, including meetings of the UN-sponsored Intergovernmental Panel on Climate Change (IPCC) and the first meeting of the parties to the Montreal Protocol on Depletion of Stratospheric Ozone. He chaired the 50-nation Response Strategies Working Group of the IPCC, which produced its first report to the United Nations in 1990.

In 1983, Mr. Bernthal was appointed by the President and confirmed by the Senate to a five-year term as a member of the U.S. Nuclear Regulatory Commission. He drafted and gained approval for the Commission's first Advanced Reactor Policy Statement. In the wake of the Chernobyl disaster, he led a 12-member interagency U.S. Nuclear Safety Delegation to the Soviet Union in 1987, where he negotiated and signed the first U.S.-USSR nuclear safety protocol. He subsequently led NRC nuclear safety delegations to Czechoslovakia, Hungary, and Bulgaria.

From 1970 to 1980, Dr. Bernthal was a professor of chemistry and physics at Michigan State University. He took leave from Michigan State in 1978, after being named Congressional Science Fellow of the American Physical Society. He joined the staff of Senator Howard Baker that year as legislative assistant for energy, science, and technology issues. In April of 1980 he was appointed Chief Legislative Assistant to then Senate Majority Leader Baker, on whose staff he continued to serve until 1983.

Fred Bernthal received the B.S. degree in chemistry from Valparaiso University in 1964, and a Ph.D. in nuclear chemistry in 1969 from the University of California at Berkeley. He carried out advanced study at Yale University in 1969-70, and at the Niels Bohr Institute of the University of Copenhagen, where he was a NATO Senior Scientist Fellow in 1977. The author of 45 publications in professional scientific journals, Bernthal is a Fellow of the American Physical Society, and a member of the Scientific Research Society of Sigma Xi, the American Chemical Society, and the American Association for the Advancement of Science.

Testimony of
Dr. Frederick M. Bernthal
President, Universities Research Association
Washington, D.C.

House Appropriations Subcommittee on Energy and Water Development
Rayburn House Office Building
January 31, 1995

Chairman Myers, Congressman Bevill, it is a pleasure to return to testify before this Subcommittee after an absence of nearly seven years since I left my seat on the Nuclear Regulatory Commission.

Unlike some testifying here today, I have never worked directly for the Department of Energy (DOE) or its predecessor agencies. But from five years on the staff of then-Senator Howard Baker, through my term on the Commission, then as Assistant Secretary of State for Oceans, Environment and Science, and finally as Deputy Director of the National Science Foundation (and incidentally, as a former university faculty member whose research was once supported by DOE), I have had the opportunity to work with and observe the Department in many of its endeavors. Since last July, my current responsibilities as president of a university consortium with management and operations (M&O) contract responsibility for DOE laboratories have afforded yet another perspective.

Among the issues the Subcommittee will examine in this hearing is the future of the DOE National Laboratories, as indeed the future of the Department of Energy itself is being reexamined by the Congress and in Secretary O'Leary's Departmental realignment now in progress. I will confine my formal remarks to the arena closest to my current responsibilities. Additional important issues which must be considered are being discussed by others here today.

The organization I head, the Universities Research Association (URA), is DOE's M&O contractor for the Fermi National Accelerator Laboratory and for the Superconducting Supercollider Project, the latter now in the final phase of its termination, pursuant to Congressional action in the Fall of 1993. My testimony today represents my own views, and not necessarily those of URA or its Trustees.

If the Chairman will permit me, I would like briefly to recount a little history of URA, not as an advertisement but because it has direct bearing on a principal theme I want to stress today -- the essential role that the nation's distinguished university centers of learning have played in the national laboratories.

The imperatives of national science policy and the requirements of the research enterprise itself led to URA's founding in 1965 under the aegis of the National Academy of Sciences (NAS). A prestigious committee sponsored by the

President's Science Advisory Committee and the Atomic Energy Commission had reached consensus on the need for a national particle physics research center with capabilities far exceeding those at any individual university facility. The question of how to marshall the nation's advanced scientific talent from universities across the country was referred to Dr. Frederick Seitz, then president of the NAS. Accordingly, Dr. Seitz convened the presidents of U.S. universities engaged in the relevant disciplines to consider management options for such a national facility.

Twenty-five universities agreed to form a consortium for that purpose, an initiative that ultimately led to URA's incorporation with the following broad mandate:

> "...to acquire, plan, construct, and operate machines, laboratories, and other facilities, under contract with the Government of the United States or otherwise, for research, development and education in the physical and biological sciences...and to educate and train technical, research and student personnel in said sciences."

In the intervening years, URA has grown to comprise 80 universities, and nearly all of the nation's leading research universities. I believe DOE would share my observation that the close laboratory-university partnership at Fermi National Accelerator Laboratory continues to be highly productive. The spirit and intellectual vitality of such partnership between government and the university research community, of which URA has been representative and from which the nation has derived such great benefit, needs to be revitalized and nurtured throughout the national laboratory system.

Now, the formation of URA in 1965 was certainly not the first time that the nation had turned to its distinguished universities for assistance in constructing and leading a national research mission. We all know the important, indeed pivotal, service the University of California rendered through the National Laboratories at Los Alamos, Livermore and Berkeley. Argonne National Laboratory also traces its roots to that era, and to the leadership of the University of Chicago and Enrico Fermi.

Mr. Chairman, the most important single issue on the agenda of America's research enterprise today may well be the future of these and their sister national laboratories in which this nation has invested so much. My message is two-fold:

First: However the Department of Energy might eventually be structured to achieve necessary economies in this time of fiscal constraint, it is essential that the capabilities embodied in the DOE National Laboratories continue to be engaged in the nation's research enterprise. With many industries cutting back or eliminating in-house research in recent years, the DOE laboratories assume added significance as national sources of new knowledge. Indeed, as the exigencies of the cold war recede into history, the laboratories will remain as the most important investment the Department has made over the years. It would be wasteful and shortsighted to permit the intellectual and capital resources they contain to be dissipated.

In some cases, preserving expensive laboratory infrastructure is in itself a cost-effective objective, since leading-edge research increasingly requires a concentration of talent and facilities that cannot be economically replicated, and do not lend themselves to dispersal across our network of universities. Priorities must surely be set as Congress and the Administration seek to achieve budget savings; other Departmental programs should be measured against the present value and long-term significance of the human and capital investment already made in the Department's research infrastructure.

Second: To maximize the return from these national assets, the historic partnership and synergy between the nation's research universities and its national laboratories must be revitalized and strengthened. The motivation for that partnership may have changed as the missions of the Atomic Energy Commission and its successor agencies have evolved since the Manhattan project, through the cold war and the oil crises of the 1970's, and now into the post cold-war era. But just as the laboratory-university partnership was essential to the nation in the decades immediately following World War II, so it remains essential today if we are to optimize our utilization of the many resources available at those laboratories.

DOE has long funded directly a great variety of research in the nation's universities, and has supported still more university research through major "user facilities" at its national laboratories. Indeed, the effectiveness and research achievement of a laboratory itself is often directly correlated with the strength of its intellectual ties to the research universities. Sustaining the vitality of the national laboratories over the long run will increasingly require a robust intellectual partnership between the scientists and engineers at the DOE laboratories and the nation's other great centers of learning. As your review of the Department of Energy, its mission, and its investment in the nation's research infrastructure proceeds here in the Congress, the value of that partnership for achieving national goals should therefore be carefully considered.

The most remarkable "national laboratory" today is a virtual laboratory -- a network of research sites scattered across the country, encompassing the great universities in which this country has invested so heavily the last half of this century. The DOE laboratories are part of that network. But the centroid of the nation's research enterprise today resides in our distinguished research universities, the envy of the world. Ironically, the university research endeavor itself is now in troubled waters. It finds itself confronted with a $10 billion requirement for modernizing research infrastructure, a problem recognized by the Reagan, Bush, and Clinton administrations, but for obvious reasons unresolved. In these circumstances, it is reasonable to ask whether the enormous investment the country has made in research facilities and infrastructure at its many national laboratories might offer a partial solution.

If the national laboratories are as important a part of this country's research infrastructure as I have argued, why change anything? Quite simply, it is clear that the status quo is not an option, and none of my comments should be understood to imply that major changes in laboratory governance, organization, and objectives are not possible or necessary. Despite the successes of the past, if current policies and trends continue I believe the national laboratories as a group will experience a slow decline. I will close by offering a few specific suggestions for actions that might help to assure that does not happen.

First, however, an observation: The national laboratories most at issue are relatively few in number, and each has its own unique character. For some, such as Fermilab, the entire laboratory revolves around a single, unique research facility used and governed by university researchers from all over the country. Others, such as the Oak Ridge National Laboratory, are broadly diversified in their programs and disciplinary thrust. Still others, such as the Los Alamos National Laboratory, have major weapons R&D components. Prescriptive "systemic" solutions should therefore be approached with caution -- one size is not likely to fit all. With that caveat, some suggestions:

> *1) The primary mission of the Department of Energy's laboratories needs to be reaffirmed as a broadly-defined, diverse research enterprise. Over time, the laboratories should evolve to become truly national research centers, available to serve a variety of "customers" in the Federal government, the states, and in industry.*

The research directions of the laboratories should be determined by the marketplace of ideas and the needs of the country, as defined by the varied customers for that research. With the continued decline of the major industrial laboratories in the U.S., this becomes a particularly important objective. The DOE Cooperative Research and Development (CRADA) program was intended to establish research partnerships and arrangements between industry and the DOE laboratories. The success of that or any similar program will be measured by the number of productive, working relationships that actually develop between the *people* doing R&D -- the scientists and engineers at the laboratories and in industry.

Much as the National Science Foundation has demonstrated through its successful Engineering Research Centers and Science and Technology Centers program, partnership among laboratory researchers, university faculty, and industry can provide a most fertile ground for discovery, and for the technology that goes hand-in-hand with discovery. It bears reemphasis that *people* in the end are the mechanism for technology transfer -- people from different disciplines, with differing perspectives, working on common problems. John Armstrong, former Vice President for Research at IBM, has aptly noted that the best technology transfer vehicle is the moving van.

2) As part of a revitalized relationship between the laboratories and the nation's universities, a strong new governing structure should be devised for DOE's major research laboratories.

This transition could begin with one or two laboratories on a pilot basis. Those laboratories should be governed by a corporate-style board of directors, composed of leaders of the nation's research universities and industries. Research programs should be structured so that distinguished faculty from interested universities become full partners with their counterparts from the laboratories and, where appropriate, from industry, in the conception and management of individual research programs within the laboratories. While this concept is not new, it also is not pervasive in the national laboratories today. The National Science Foundation's Engineering Research Centers and Science and Technology Centers mentioned earlier may offer a useful model in this context.

3) When it comes to environmental and occupational safety stewardship, the Department should simply require its laboratories to comply with existing law, as any university or industrial research community is already required to do.

Let me be clear on this point: By the term "national laboratory" I mean the Department's active research centers, as distinct from so-called "production" and related facilities. In those latter facilities, I fully understand the Department still struggles with special problems -- a difficult legacy of the cold war. But with regard to the national laboratories *per se*, DOE should be freed from the regulatory spiral that seems to have reached a point where the Department is required, in effect, to maintain its own Nuclear Regulatory Commission, its own Environmental Protection Agency, and its own Occupational Safety and Health Administration. Whatever arguments may once have rationalized such an arrangement, they have largely evaporated with the end of the cold war. Normalizing regulatory oversight and requirements for the Department's research laboratories by placing that responsibility in the hands of the appropriate agencies almost certainly will result in more cost-effective operations.

4) Finally, the spirit of genuine delegation of responsibility by the Department to its partners must be recaptured.

The Department must reestablish in fact, not just in name, the principle of the Government-owned, contractor-operated (GOCO) laboratory, in contrast to a system that has become, for all practical purposes, government-owned and government-operated. Where universities have lead responsibility in this partnership, as I believe they should, they must bring a new sense of intellectual, as well as managerial, ownership and involvement. The Department, for its part, should judge performance on the basis of results -- on the quality of research and scholarship, as judged by a strong peer review system, and on compliance with existing regulatory and other law. In short, the Department should become the tough auditor, not the manager acting through a contractor surrogate.

I will close by repeating the themes I began with: First, whatever form Congress and the Administration might ultimately agree is best for the Department of Energy, whatever economies are achieved through Departmental realignment, it is essential that the "crown jewels" of the Department -- the research capability embodied in the national laboratories -- continue to be utilized. Building on a legacy of accomplishment, that enterprise can lead to a new generation of achievement in the service of the country. Second, to sustain a vigorous and productive network of national laboratories, the historic partnership between the nation's distinguished research universities and its national laboratories, that fruitful synergy that has served the country so well, must be revitalized and substantially strengthened.

Mr. Chairman, it is often easier to envision the desirable endpoint of a transition than it is to chart a painless course to that end. It is no different here, in trying to chart the future of the Department of Energy or even of its national laboratories on which I have focused in these remarks. But difficult as the changes may be, they are far better than some of the alternatives that have been suggested. I hope some of these ideas might help point the way.

I would be pleased to answer any questions Committee Members may have.

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Mr. MYERS. Thank you, Dr. Bernthal.

I apologize, we have a vote on, and we are going to try and keep the meeting going in the interest of getting you out of here as early as we can, so we will try to keep it going.

Next is another witness who is no stranger before this committee, both an engineer as well as an attorney, kind of a strange combination there. John—I guess I have known him for a long time—came a long way, started at the Federal Bureau of Investigation, then later served as a staff member for the old Joint Committee on Atomic Energy, and then has come a long way in industry, primarily the last few years has been in safety, how we might get nuclear energy safe for both the operator as well as all of us as consumers, and is presently Chairman of the Defense Nuclear Facilities Safety Board.

John, welcome.

OPENING STATEMENT OF JOHN T. CONWAY

Mr. CONWAY. Thank you, Mr. Chairman, other Members of the committee. Due to the lateness of the hour and the vote that is coming forward, I will be very short and wait for questioning. I would just like to make a couple points, if I may.

I have been associated one way or another with Dr. Teller since 1956, when I was on the Joint Committee on Atomic Energy and I had responsibility for the military program, the authorization and reviews of the weapons program. I must say that, Dr. Teller, I agree with you rather than Johnny Foster, in the difference that you and your friend have, as to whether or not the defense, DOE defense work, should go over to the Department of Defense.

As I point out in my prepared statement, my written statement, if it did go over there, I am afraid it would be lost, it would have difficulty in having sufficient funding for it, and the only way I think it would stay alive there in its proper form and with the need it has for proper funding would be if it were set up as a separate independent agency within the DOD with its own money.

I must tell you, for example, in the DOE today, a Deputy Assistant Secretary for Defense is a military officer. There have been, in the five years my board has been in existence, there are three individuals who have served in that position, and I suspect before the year is up there will be a fourth one there. They come in for two years, rotate in and rotate out.

The military today is really not that much interested in nuclear weapons. And if you are a young officer with a career in which you wish to make a career in the military, you don't opt to go into the nuclear weapons side. Unfortunately, it is almost like the chemical corps. People don't go in the chemical corps if you really want to make a career in the military. And we found out when we went into the Persian Gulf War, desert war; when we knew our opponent had chemical capability, we found we had to go out and we had to buy equipment from other military services because we were not prepared in the chemical side.

So I am afraid if this were to go over to DOD, unless it were an independent agency, completely and separately funded, we would be in trouble.

Also, Dr. Teller made reference to Los Alamos study that has been updated right periodically. There actually were 26 individuals back in the 1940s that had intake of plutonium. And there has been a study of these 26 individuals. Some have died, as Dr. Teller has mentioned.

And I can relieve him of the responsibility of getting you a copy. I keep it in my office and I have it on tickler. Each year, once a year, it comes up before me. I check with Los Alamos: Has it been updated?

And as of now, after all these years since the 1940s, only one individual has come up with an illness that might have—and I stress—that might have been caused by the inhalation of plutonium.

So this statement that plutonium is the most dangerous material in the world is way, way overstated. But that is an excellent study, and, Dr. Teller, I will be prepared to make that available to the committee. I have it, as I say, on tickler.

Mr. MYERS. If you would, please.

ENVIRONMENTAL CLEANUP

Mr. CONWAY. Dr. Teller also made mention, and as he said, he thinks that the $7 billion—I think it is $6 billion this year, it was $5.5, as I recall, last year—I think they are asking for $6.5 billion this year for cleanup, but that could be significantly cut back.

I would suggest that your committee might want to look into how the money is being used. It is not being used for cleanup. Even though it has been earmarked for cleanup, as during the period of time our board has been looking into the problems out in the field, this money is currently for waste management. Very little cleanup is taking place. It is managing the material that currently is in the sites.

And there is a real question: Is it being properly administered? We have made several recommendations, the most recent one has been 94–1, and we are pushing on that because there are certain things that should be taken care of in the next two to three years in proper waste management, where we have material that is in unstable form that should be stabilized.

What I suggest to you, there has been very little decontamination, very little decommissioning, and there is very little cleanup for that money. It is maintaining the waste as it exists today in most of these sites. So I suggest you might want to take a look at that.

Dr. Happer made reference to, there are too many people at DOE. I cannot disagree with that. I think he is absolutely correct. The problem, however, is the need for technically competent people.

When the Congress in 1988 passed legislation to set up the Defense Nuclear Facility Safety Board, which I am privileged to chair, one of the objectives that Congress recognized the problem and one of the objectives of our board is to increase the technical competence of DOE personnel. And that has been in the one area we have been pushing, and I think it is very necessary to continue to push in that area.

So what we do need is not more people in DOE. We need technically competent people to oversee the contractors, to see the work is done properly.

I might disagree with Fred a little bit on oversight—or I guess it was Will—on oversight of the laboratories by the government. Having spent nearly 13 years up here helping to authorize funds to maintain the laboratories, I think it is essential that the government have responsibility, since they make the money available, have responsibility to see that it is properly utilized. Here again, the answer is having technically competent people interface with the laboratories and see that it is done.

Nobody should ever object to auditors that know what they are doing, coming in and looking over the use of the money that is being properly utilized. So I would suggest what we need there are competent people to do that, and that there has to be accounting, always has to be accounting when you are taking taxpayers' money.

There are a number of other things I would make reference to, but in view of the short time, I would like my prepared statement, my written statement, to serve for that purpose.

Thank you, Mr. Myers.

[The statement of Mr. Conway follows:]

TESTIMONY OF
JOHN T. CONWAY, CHAIRMAN
DEFENSE NUCLEAR FACILITIES SAFETY BOARD

POSSIBLE RESTRUCTURING OF THE U.S. DEPARTMENT OF ENERGY

SUBCOMMITTEE ON ENERGY AND WATER DEVELOPMENT
COMMITTEE ON APPROPRIATIONS
UNITED STATES HOUSE OF REPRESENTATIVES

JANUARY 31, 1995

John T. Conway, Chairman
A.J. Eggenberger, Vice Chairman
John W. Crawford, Jr.
Joseph J. DiNunno
Herbert John Cecil Kouts

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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JOHN T. CONWAY

John T. Conway, an engineer and attorney, is Chairman of the Defense Nuclear Facilities Safety Board. His nuclear experience includes 12 years on the staff of the Joint Committee on Atomic Energy, U.S. Congress (six years as Staff Director), 11 years as President/Chairman of the Board of the American Nuclear Energy Council, and eight years as Chairman of the Con Edison Indian Point Nuclear Facilities Safety Committee. Following is a brief resume:

Oct. 1989 - Present	Defense Nuclear Facilities Safety Board, Chairman
1982 - 1989	Consolidated Edison Company, Executive Vice President
1982 - 1989	American Nuclear Energy Council (ANEC), Chairman
1978 - 1982	American Nuclear Energy Council (ANEC), President and Chief Executive Officer
1968 - 1978	Consolidated Edison Company, Executive Assistant to Charles F. Luce, Chairman of the Board (1970-78, duties included Chairman, Nuclear Facilities Safety Committee)
1956 - 1968	United States Congress, Staff, Joint Committee on Atomic Energy (1958-62, Assistant Staff Director; 1962-68, Executive Director)
1950 - 1956	Federal Bureau of Investigation, Department of Justice, Special Agent - served in Kentucky, New York, Washington, D.C.
1949 - 1950	Meighan & Necarlsomer Law Firm, Associate
Education	Columbia University School of Law, LLB, 1949 (converted to Juris Doctor, 1969)
	Tufts University, BS Engineering, 1947
Military Service	U.S. Navy, active duty February 4, 1943 to September 1946; Saw service in North Atlantic, USPC781, Discharged Lt.(j.g.)
Professional Memberships	Admitted to New York Bar, 1949, and Supreme Court of the United States, 1953
Awards	Grand Council of Hispanic Societies in Public Service Humanitarian Award
	The James and Jane Hoey Award for Interracial Justice

December 1994

MR. CHAIRMAN AND MEMBERS OF THE SUBCOMMITTEE:

I am here in response to Chairman John Myers' January 19, 1995 letter inviting me to testify on the possible restructuring of the Department of Energy (DOE).

My testimony today focuses on the DOE programs with which I am most familiar -- the DOE nuclear defense operations.

For the past 5 years, I have been the Chairman of the Defense Nuclear Facilities Safety Board. The Board is a relatively new agency, therefore a few words about its nuclear safety responsibilities and its relationship to DOE are in order. Congress created the Board in 1988 as an independent organization within the Executive Branch to provide advice and recommendations to the Secretary of Energy regarding public health and safety at DOE defense nuclear facilities. The Board came into being October 18, 1989, when the five members were officially sworn in after nomination by the President with the confirmation of the Senate. By law, Board members are required to be experts on nuclear safety.

By statute, the Board is required to review and evaluate the content and implementation of health and safety standards, as well as other requirements, relating to the design, construction, operation, and decommissioning of DOE defense nuclear facilities. The Board recommends to the Secretary of Energy specific measures that the Board determines should be adopted to ensure that public and worker health and safety are adequately protected. The Board is also required to review the design of all new defense nuclear facilities before construction begins, and to recommend modifications necessary to protect health and safety. Board review and advisory responsibilities continue throughout the construction, testing, operation, decontamination, and decommissioning of DOE defense nuclear facilities. In addition the Board has safety oversight of the assembly and disassembly of nuclear weapons and the testing of these weapons.

During the past few years, unprecedented change in the mission of the Department of Energy's nuclear weapons complex has occurred, influenced most strongly by the upheavals in the global political scene. Production and testing of nuclear weapons has ceased. DOE has sharply curtailed processing of nuclear materials. Disassembly of thousands of nuclear weapons is proceeding. Many sites and facilities are being shut down and their facilities readied for decommissioning and decontamination, resulting in the start of a mammoth clean-up effort.

Many technical issues arising from the DOE's change in mission have never been addressed before; others involve operations and processes that are new to the nuclear weapons industry. For example:

- As a facility is deactivated and decommissioned, the workers are subjected to more hazardous conditions than during operation. The workers will come into closer contact with radioactive materials, enter portions of facilities that were not intended to be occupied and will face other unexpected conditions.

- The aging and degradation of equipment that is at the end of its design life will present increasing hazards as safety systems become unreliable and break down more frequently.

- In some instances, plutonium metal was stored in direct contact with plastic bags. As plutonium decays it emits radiation that can cause the plastic bags to become brittle and give off hydrogen gas. Hydrogen itself is explosive and can also interact with the plutonium to form a material that can spontaneously ignite when subjected to air. These conditions increase the hazards associated with handling and storage of this material.

- Highly radioactive spent fuel stored in basins that were not intended for long-term storage is corroding. The associated hazards will continue to increase until corrective actions are taken.

- Throughout the complex, acidic solutions of fissile materials are being stored in tanks, bottles and process lines. The longer these materials are stored, the greater the likelihood there could be an accident caused by chemical changes in the solutions, natural phenomena, personnel error or deterioration of containers.

- The continuing national commitment to dismantle approximately 2,000 nuclear weapons per year will significantly challenge the DOE weapons complex that is experiencing a coincident erosion of technical capability and limitations in physical plant capacity. For example, DOE has experienced several technical and safety-related difficulties in dismantling the W-48 weapon system; these have resulted in several significant delays while required safety-related and other technical changes have been incorporated in the disassembly procedures.

- The aging of the Nation's nuclear weapons stockpile will also present unique challenges. Modifications may need to be made to extend the life of today's weapons, and difficulties, as yet unforeseen, are likely to develop during the weapons surveillance process. Such occurrences could have significant safety and reliability consequences.

Your letter, Mr. Chairman, requested that I present my views on the possible restructuring of the U.S. Department of Energy. Given the massive changes in mission and the serious scientific and technical challenges that must be addressed throughout the defense nuclear complex now and in the foreseeable future, the question of who can most effectively perform the work -- the DOE or some other organization or organizations -- comes to the forefront of the debate.

Excluding the Naval Reactors Program, within the DOE defense nuclear complex today, the operating mission can be divided into 4 distinct groups of activities: (1) the identification and stabilization of the nuclear-chemical by-products from 50 years of nuclear weapons production and testing; (2) the decontamination and decommissioning of contaminated facilities no longer considered necessary for defense nuclear activities; (3) the disassembly of thousands of nuclear weapons; (4) the consolidation of our nation's capability to safely maintain a reliable smaller stockpile for the foreseeable future, without dependence on nuclear testing.

While each of the above operating missions currently being conducted by the DOE and its contractors may appear to be discrete programs, capable of being divided up and assigned to different groups within DOE or perhaps to other Federal agencies, the need for close coordination among these activities and strong leadership is seen on a daily basis. For example, stabilizing certain plutonium and other highly radioactive waste stored in various forms throughout the DOE weapons complex may require the short-term operation of certain DOE facilities targeted for decommissioning. This same waste characterization and stabilization effort also require the technical support of experts employed by the DOE weapons laboratories where much of that knowledge and expertise reside.

A number of suggestions have been voiced recently as to disbanding the DOE and assigning its responsibilities to other existing government agencies. Some of those suggested are as follows but in my opinion carry with them certain impediments or problems:

1. Transfer the stewardship of the nuclear stockpile and its safety and reliability responsibilities to the Department of Defense (DoD).

   Problem: Officials of the DoD have been quoted as saying they do not want to assume that responsibility. Also competition for funding among the four services and the numerous existing DoD laboratories will make it difficult for the three nuclear weapon laboratories and the nuclear weapon complex to remain viable unless set up as an independent agency within DoD with a dedicated budget.

2. Transfer the DOE stabilization and clean up program to the Environmental Protection Agency (EPA).

   Problem: Much of the technical competency regarding Plutonium, Uranium and highly radioactive by-products resides with weapon laboratory personnel and those associated with the defense complex and not within EPA. Also, EPA as regulator would be put in the position of regulating its own work.

3. The U.S. Nuclear Regulatory Commission should have regulatory authority over all or parts of the defense complex irrespective of whether the nuclear defense activities are maintained in DOE or transferred elsewhere.

   Problem: The current NRC Chairman, I believe has taken the position that NRC would not wish to assume responsibility for existing nuclear defense facilities but only for those to be built in the future. Thus, major existing stabilization and clean up problems would not be attended to. Also the government and the civilian nuclear industry traditionally have wanted civilian and military nuclear matters kept separate. NRC costs are borne primarily by user fees assessed against nuclear utilities who already complain of excessive charges. Keeping separate accounts and apportioning cost will be complicated and I believe will be suspect by utility and tax payer groups. In addition a major question arises as to what extent should a national security activity -- the nuclear weapons complex -- be subject to licensing by an agency not having primary national security responsibility.

Whether DOE is restructured or is disbanded and its work assigned to other agencies, the fact remains that its nuclear defense complex must be attended to by technically competent individuals having line management responsibility. I believe that the question of which agency runs these programs is much less important than the question of technical competence of the individuals entrusted with their direction. In my view, adding additional layers of Federal regulation or licensing adds additional costs to an already expensive program, but offers no guarantee that increased competence will result. I believe that the successful accomplishment of an agency's mission arises from having a cadre of technically-qualified persons individually and organizationally committed to achieving its mission.

Based on 5 years of conducting oversight activities on health and safety issues throughout the DOE nuclear weapons complex, the need to attract and retain competent Federal and contractor personnel has emerged as one of the most serious deficiencies affecting DOE's ability to successfully accomplish its mission. Consequently the Board has made 18 specific recommendations to the Secretary of Energy citing this deficiency and recommending ways of strengthening DOE's technical competence. DOE and its major contractors continue to face severe problems in recruiting and retaining well-qualified personnel, despite efforts to improve the situation. Some of the most experienced scientists, engineers, and technicians in the weapons complex have left the program. Recent DOE initiatives to respond to the Board's Recommendations in this critical area are only now beginning to mature sufficiently to provide limited relief.

I cannot overemphasize the importance of having technically competent staff at both the Federal and contractor level. Based on personal observation, the U.S. Atomic Energy Commission, a predecessor organization of the DOE, in its formative days was able to attract and retain some of the finest scientific and technical talent as Federal employees to provide essential leadership and program guidance to its contractor work force. With the introduction of each major restructuring in 1974 and 1977, I believe that there has been a steady decline in the quality of the Federal scientific and technical staff, with a corresponding increased reliance on the DOE contractor work force to fill the "technical void". For example, with the formation of the Department of Energy in 1977, the ability to hire scientific and technical staff using the excepted service provisions of the Atomic Energy Act of 1954 was lost. In response to Board Recommendation 93-3 on improving the technical talent at DOE, the Secretary of Energy requested and late last year received legislative authority to hire up to 200 additional scientific and technical personnel using excepted service authority. The Board has used this authority effectively as a key way to build a highly competent technical staff.

Focusing strictly on the DOE defense nuclear complex, success or failure in achieving a reasonable clean-up program and maintaining a reduced nuclear weapons capability rests with the competence of the technical and managerial staff assigned to the job. Irrespective of whether the Congress and the President decide to assign these functions to another agency, retain DOE in its present role, or some combination of these two options, I believe that the quality of the technical staff assigned to fulfill the mission must be upgraded substantially.

As noted earlier, the DOE has become very dependent on its contractors to provide the scientific and technical talent needed to fulfill its various program missions. The Board has been concerned with the loss of unique talents from DOE and its contractor organizations caused by the down-sizing of the defense nuclear complex. This concern is particularly acute for the weapons laboratories and the facilities involved in the assembly, disassembly, and maintenance of weapons, where budget pressures and other constraints are leading to the severe erosion of the talent pools upon which much of the weapons program has depended.

In summary, the DOE mission related to its defense nuclear programs has shifted significantly in recent years. Based on 5 years of full-time oversight work to ensure that public health and safety is adequately protected throughout the DOE weapons complex, I can attest to the seriousness of the technical, legal, and managerial problems faced by the DOE and its contractors. With the shut down of many DOE facilities, the conditions and hazards being faced by DOE are potentially more urgent and present a more serious safety problem than when the facilities were in operation. If the DOE or any successor agency(s) is to be successful in meeting the technical and managerial challenges that exist today throughout the complex, a substantial increase in the caliber of scientific and technical talent must occur within the support contractor organizations and especially in the Federal staff. I emphasize that I am referring to quality of technical staff, not quantity. If adequacy of financial resources were the answer, the clean-up problem would be well on the way to solution.

Finally, let me observe that, given the strong emphasis of both the Congress and the Administration on a leaner, more effective government, any concept of restructuring the DOE should be subject to cost/benefit considerations. It hardly seems likely the fractionization of the current mission of the DOE defense nuclear complex and a re-distribution of the activities involved will pass the cost/benefits test.

Thank you for the opportunity to testify before you today. I will be happy to answer any questions you may have.

Mr. MYERS. Well, thank you, John. Each of your prepared statements will appear in the record, as well as the bios of all four of you, because I think, especially for new Members. I am sorry I wasn't able to include everything that you have done, and maybe you prefer it that way, too. But I have a series of questions here.

If you will remain just briefly here, Chairman Bevill will be back just shortly, and I will try to get back to summarize here, too. So we will stand in recess just temporarily for a couple minutes until Chairman Bevill gets back.

Thank you.

[Recess.]

Mr. ROGERS [presiding]. The committee will come to order.

While the other Members are on the Floor voting, I have done my chores there, and perhaps we can save a little time and continue the hearing. And I will be able to ask questions and by the time the Chairman returns, perhaps he will be ready to go.

LONG-TERM ENERGY RESEARCH

Thank you gentlemen for being here and for your testimony. Dr. Happer, last week several witnesses came before the committee to say that the Federal Government should not fund energy research and development. Do you believe the Federal Government should support long-term energy research and development and, if so, how should we do it?

Dr. HAPPER. Yes, I do believe they should. I mean, I think Dr. Teller made a good point that there are very promising technologies out there. I don't want to comment on them in detail because that was never my portfolio when I was in the Department of Energy. But if the Federal Government does not, I don't know who will. How you make the decision of how much to put into each is the difficult one because it is a finite pot of money.

Mr. ROGERS. What criteria should we use to evaluate the energy research and development programs currently funded in the Department of Energy? How can we objectively measure that?

Dr. HAPPER. Well, certainly one way to do that would be to get energy consumers involved in the evaluation. So I would certainly have people from utilities and technically-minded people from the utilities, of which there are many, as well as people perhaps from the outside because there always has to be a little push from the outside.

If you always stuck with the utilities, you know, we would still be trying to run automobiles on steam engines instead of internal combustion engines or airplanes on pistons instead of jets. So there has to always be a push from the wild-eyed engineers from the outside. So a judicious mix.

Mr. ROGERS. DOE operates nine multi-program laboratories encompassing a wide range of energy R&D programs; 10 major single-program laboratories that conduct programs in focused areas such as fusion or accelerator-based user facilities; and 11 laboratories with specific missions.

Again, what kind of criteria could we use to evaluate the effectiveness of those labs?

Dr. HAPPER. I think my colleague, Fred Bernthal put his finger on it and that was peer review. Certainly when I was at the Department of Energy, I was very sensitive that I was spending a lot of taxpayers' money and I insisted on having my programs reviewed. I got a lot of flack for that. In fact, I was sued for that. I am quite sensitive to that. And I think that if you put together the right kind of a peer review, you can pretty well grade these things and, if you have to cut, you can at least keep the very best.

Mr. ROGERS. And how would you rate the effectiveness of the laboratory technology transfer program at the energy research labs?

Dr. HAPPER. I think it is spotty. I perhaps can be permitted a personal comment. I am trying to run a little company now in which we need diode lasers and the best diode lasers in this country are made at Livermore, and they have been extremely helpful to us.

They bent over backwards, I think, to accommodate a small business. And in my personal experience it has been extremely successful. You can hear just the opposite stories from other people. So I think it is a little bit of luck as to how you do.

Mr. ROGERS. A little bit of luck?

Dr. HAPPER. Luck, yes.

Mr. ROGERS. Some witnesses have appeared before the committee questioning the need for DOE to fund applied research programs. Would you agree with—that we should, and how can we distinguish between those energy research and development programs which support applied versus basic research?

Dr. HAPPER. I think very near-term applied research is not something that any Federal agency should be involved in. That is something for the private sector. There is nothing we can do about, in the Federal Government, something that is close to the consumer. I think for the longer term, it is very appropriate for the Federal Government to be supporting some applied research.

Much of the work on, for example, lasers that has worked its way out, just to speak to something that I think about, has come from the Federal labs and is now producing a lot of income for the private sector. It would not have been developed without that Federal seed money. But at the time that money was going in, there were no products and nobody in industry was willing to put the money in. And it has gradually turned into a winner. Our competitors in Japan do much the same. They put a lot of money into applied programs.

EDUCATION PROGRAMS

Mr. ROGERS. Dr. Bernthal, DOE spends more than $100 million on mathematics and science education programs. Have you seen any noticeable results from that activity and do you have a recommendation as to whether it should be continued?

Dr. BERNTHAL. Well, in fact, it is probably a little early to cite noticeable results. But what I will say is that—and in fact, if we had done everything right in K through 16 education over the years—I might say the National Science Foundation has also spent a lot of money in that area— one could argue that we would not be in the situation that we are in today.

But I think that the leadership the Department of Energy has shown, it has since been emulated, I think appropriately so, by NASA, EPA, and I am sure other agencies as well, the leadership the Department of Energy showed and began under Admiral Watkins' tenure, especially, is just very important. I mean, I can speak for Fermi Lab, and I know this goes on at the other national laboratories, they have all come to view part of their mission as an outreach to the surrounding communities doing what you can for education where you are in assisting this problem that we have in our country.

I suspect that that is one of the more cost-effective expenditures that the Department has made over the last several years. Difficult to prove.

Mr. ROGERS. Could we eliminate the DOE and fund energy research programs directly through a system of universities?

Dr. BERNTHAL. Well, you know, I have never been one to believe that you solve problems by rearranging organization charts. I will just say that as a general principle. As a matter of fact, if you can do it, if you can resolve problems and issues and other people testifying here today have suggested some that exist in the Department, and so have I, if you can resolve them from within, I think that is always more desirable. So that would be my first statement about maintaining the integrity of the Department as an organization.

Now, you specifically asked whether the research could be done disbursing it to universities. The answer to that is, no, certainly not in some cases, for example, and I alluded to this in my testimony, where you have large central facilities required in many cases.

Fermi Lab is a perfectly good example. There are others, the universities simply have to cooperate as users on those facilities. So there is a good deal of cost-effectiveness to be gained by a system of centralized laboratories and facilities in this country. So certainly not all of those could be disbursed to individual universities.

Mr. ROGERS. What would you suggest to improve and focus the research and development programs currently managed by DOE.

Dr. BERNTHAL. I am sorry, was the word to focus them?

Mr. ROGERS. Improve and focus.

DIVERSITY OF THE LABS

Dr. BERNTHAL. I am not sure who suggested it of the various people testifying here, but I always have some concerns when one or another lab becomes too specifically mission-oriented. I think the real strength of that research establishment over the years, actually from the outset under the old Atomic Energy Commission although that was mission oriented research in a sense, that was very, very broadly interpreted.

And so I do not suggest that the focus of a particular laboratory or of that entire network of laboratories be narrowed. Rather, I think it should be broadened as I indicated in my testimony, they should be available to serve in the marketplace of ideas doing the projects that the Federal Government or industry, perhaps even the states wish to have done, should be permitted in the longer run to put the best and smartest people on those projects as the opportunities arise.

And therefore I think my answer to your question is, I think diversity is the solution, not trying to achieve a narrow focus within the laboratories.

Mr. ROGERS. I will have further questions as time passes.

Mr. Bevill?

Mr. BEVILL. Thank you, Mr. Chairman.

Dr. Bernthal, we welcome you back. We are used to hearing your testimony. You always do a good job, and we look forward to hearing from you.

You know, the Energy Department will come in and testify on this program that they are all excited about, they want to get it started and do a lot of research. We keep appropriating money and appropriating it, then the first thing we know, the director was retiring there—one of the sections there not too long ago—and he came in and said, you know, last year someone came from the Department and recommended that we discontinue that program because it was not getting anywhere on the research.

One thing I would like to leave with you is that we don't think you ought to start research programs that you are not going to see all the way through. And I said, well, how do we—what do we do? We rely on you experts. You come in and tell us about this great program. And somebody else comes in and tells us it is great, then somebody else comes in and says it is a waste of money, we ought to discontinue this program. Now what do we do?

So we cannot seem to ever get a system of determining—I realize that in research there is going to be some waste. We know that. But we pour billions of dollars into research and I am very supportive of research, but I wish there was some way we could get a handle on where the prospects are fairly good. If it is just 50–50, you know, it would be a big improvement.

And I could just name many programs now that we do that, you know. And we don't have anything to show for it. We spend billions. Could you give us any help on that?

Dr. BERNTHAL. Well, I have a couple of comments. First of all, one has to focus not only on the original objective, particularly now I am talking about blue sky research, the very basic and fundamental research.

Mr. BEVILL. Say energy, for example.

Dr. BERNTHAL. In the energy arena for example.

Mr. BEVILL. Dr. Teller told us that big old windmill in Hawaii is ugly. He said it is ugly, and we are proud of our windmill. Of course we haven't seen it but he has, and he is probably right. That is the only kind of results we seem to get on anything. In effect, Dr. Teller was saying, why did you build that big old windmill out in Hawaii for?

Dr. BERNTHAL. You mentioned the fusion program earlier, and there is an example of one point that I wanted to make and that is that although from the standpoint of a Member of Congress, and I remember when I was up here as a staff person, it always seemed like the results were 30 years away. That is not true, by the way, in the case of fusion energy enterprise.

Mr. BEVILL. I didn't mention fusion, but that is all right. Go ahead.

Dr. BERNTHAL. It is not just the final objective that is so important, it is also what happens along the way. A statement can be made that science owes more to the steam engine than the steam engine owed to science. What that means is that these things travel hand in hand. And even though the objective of fusion may not have been achieved by now, there is an enormous amount of energy that does get spent off along the way.

PEER REVIEW EVALUATION

I want to make another point as to how you evaluate things. It has been alluded to already by Will and others. I know there have been criticisms of the peer review system. The National Science Foundation has used the peer review system as the touchstone of its existence over the last 40 years. I simply don't know of a better way to do that. If someone can tell me a better way, I would like to hear it.

But a properly administered consultation with the best people you can find who are disinterested, by the way, I think in any endeavor is the best way that you are going to get the kind of answers that you need up here. And so I would strongly support to the extent that Will began it, I applaud him. I believe the Department has established in recent years a stronger peer review system. And I have to tell you, I think that remains the best way to get the answers that you need.

OVERSIGHT COORDINATION

Mr. BEVILL. Thank you.

Mr. Conway, it is good to have your annual visit. And we always look forward to hearing from you. One of the main complaints by the DOE laboratories is the substantial number of internal and external oversight groups and auditors who continually disrupt laboratory operations. They are overseen by regional agencies and State and Federal oversight entities such as yours—the Defense Nuclear Facilities Safety Board. Clearly there has to be a better way.

What would you suggest to make sense out of the apparently uncoordinated oversight groups? Everybody is overseeing somebody else and we are not getting very far—it is not working too well. Do have you any recommendations?

Mr. CONWAY. First off, I am in sympathy with them with the myriad type of overseeing that is taking place at their laboratory. As I stated earlier, basically any organization that is getting taxpayers' money has the responsibility to use that money in the proper way. And so there is a need for some oversight from the point of view of assuring that the money is being properly utilized. But the key in any of this is those individuals who are doing the oversight have to be technically competent in what they are doing.

It has been my experience, whenever you are dealing with someone that you have oversight responsibility for, if you know your job, if you know what they are doing, can you talk as expert to expert and then that is where you don't have problems. It is when you have people coming in that do not understand what they are supposed to be doing, do not understand the technical work that is being done, and there is too much of that going on, in my opinion, today.

And one of the points that I have raised in my paper and we keep raising, and I think the Congress has raised in the past, is that it is imperative, at least as far as the DOE is concerned, that the DOE personnel be technically competent in what they do. And as one of the previous witnesses said, there are too many people already in the DOE, and I cannot disagree with that.

What we have found is that there are not enough who are technically competent. The limited area in which I deal as the safety board and the responsibilities that have been given to our board, we have found some safety problems at the laboratories. And when we brought it to the attention of the laboratories, they have closed down some operations when we have brought it to their attention.

Now, one can be overzealous in attending to following bureaucratic requirements. I have had some discussion with the lab directors that in my opinion they were overreacting on this thing that we called to their attention, some safety problems, and I think they overreacted. And I told them what you are doing—they took more than 100 people and put them to work in reviewing their meeting of the standards, the safety standards. I suggested to them they were overreacting on that. They could take one facility, the TA facility, TA–55, and look at that. That was a production facility; it was not R&D.

So there is a need for people who are technically competent that can converse with each other, interspeak and understand each other. Yes, there is too much oversight in some of these in many ways, but technically competent people on both sides is what is important.

Mr. BEVILL. We are hearing from many people that there ought to be cuts on personnel in the Department of Energy. You know, one way is by normal attrition which we like to do because, in that way, people don't lose their jobs.

Some suggest just across-the-board cuts. Some suggest cuts by the Department, cuts by sections in the Department. Some suggest just letting the Department cut so many. Do you have any thoughts or any suggestions on that?

Mr. CONWAY. Yes, sir. One, the first suggestions that we have made both to Admiral Watkins and to the present Secretary, and also to this committee, and your committee reacted properly in that and did follow through, and that is the need for the Department to have what we call excepted service. They were at complete disadvantage compared to the National Science Foundation, the NRC and the old AEC. They had to follow the very stringent requirements of civil service.

Any time they hired someone or promoted someone, it had to be by posting the jobs, waiting long periods of time so that everybody had the opportunity to try to get that job, to review it in a very formal way. And it took long periods of time and so good people were not going to hang around that long.

This past Congress, your committee, with the help of other committees, passed legislation which in effect now gives the Department of Energy excepted service capability. They can hire people quicker and promote them quicker.

Another thing they can do is look at some of the people they have now. Pull out their job description and they will find that it is inflated, and look and say, all right, are you competent to do that job? You are being paid as a Grade 15 or an SES and you are supposed to be running and responsible for such and such a program. Are you doing it?

And when we go and meet with some of the officials at DOE that have responsibility for these programs, we find that they are not knowledgeable of the program. And we find our staff people when they go out in the field know more and find out more, and come back than the particular individual that has responsibility according to "this is the job description so that has to be done."

And I think I would encourage some of those people either to take control of the jobs they are supposed to be doing or else get out of the way. But we don't need more people and we can do with less people, but they have to be technically competent and do the work that they are being paid for.

Mr. BEVILL. Thank you.

Thank you, Mr. Chairman.

Mr. MYERS [presiding]. Mr. Frelinghuysen.

Mr. FRELINGHUYSEN. Thank you, Mr. Chairman.

I apologize for being absent. I did not have the benefit of hearing your oral testimony, but I did make some notes on the written testimony. I had some general questions on the whole issue, Dr. Bernthal.

You have in your written statement on page 3, and I quote:

> The most remarkable national laboratory today is a virtual laboratory—a network of research sites scattered across the country, encompassing the great universities in which this country has invested so heavily the last half of this century.

INTERNATIONAL COLLABORATION

Could you relate that statement to what we are doing as a Nation relative to other nations? The whole issue that I have read before I got down here of collaborations with other nations in terms of research projects, and where that fits into this overall picture, if we are not the only Nation with limited resources and to what extent should we be joining with other nations? And to what extent have we joined with other nations?

Mr. BERNTHAL. In many respects, of course, that network is truly international in scope today. When it comes to Federal dollars, it still is predominantly, of course, a domestic network. Nevertheless, we talked earlier in this hearing, I believe, during Dr. Teller's testimony, about the very large projects. The subject has come up of the international collaboration on such projects.

And I would just say categorically that in the future notably on these very large projects that require a heavy capital expenditure over a series of years that, we simply must seek international participation on that kind of project. If there is a single thing that led to the demise of the SSC, of course, it is money.

If we had had more foreign participation in the beginning on that project, I suspect it may have been finished. This is nothing new, what I am saying here. I believe that most people in this city now would agree with the statement that when projects are very large, require sustained capital investment over several years, we simply have to collaborate with other countries.

Mr. FRELINGHUYSEN. Thank you for your response.

Thank you, Mr. Chairman.

FUSION

Mr. MYERS. Thank you, Rod.

Dr. Happer, we are all concerned about nuclear energy and we are concerned about fusion as part of the nuclear future. The committee, as you all know, has been concerned about fusion and has been supporting fusion to an extent, maybe not as much as really needed, and now, there is a discussion about ITER.

Can we afford ITER?

Dr. HAPPER. Nobody knows how much it is going to cost. And nobody knows whether it will be possible to get foreign countries to agree on a site for ITER. So I could envision years of struggle to try and pick a site, and maybe a site will never be picked.

All the time, there will be a standing army that you have to feed of people who are working on ITER and designing ITER. They sit and design year after year, and yet nothing real gets done.

So I guess that is my nightmare when I look at ITER, that it is not under our control as a single country. We have a hard enough time making decisions even within this country, but let alone with three or four partners. I think in the ideal world, if it were something like a national emergency, you know, like a war where we have allies, then certainly we could do it. But I don't know.

Right now, when it is sort of an economic thing, status thing, I am speaking very frankly, I am just not sure whether it will happen. In the meantime, of course, it has an enormous impact on our national program because it is the centerpiece of our fusion program. Everything goes for ITER and then what happens to the native American program?

Mr. MYERS. Are you suggesting, then, that if we do go for ITER, we get to keep some of the other fusion programs, we are going to suffer and other research is going to suffer?

Dr. HAPPER. Yes, sir.

Mr. MYERS. Gosh, we are at least 40 years behind on fusion now, and when the Chairman and I came on the committee 25 years ago, we were promised within 5, possibly 10 years we would at least have a working model of fusion reactor that we could expect.

Dr. HAPPER. Mr. Chairman, I am not in the fusion business, but I am from Princeton and I respect them very much at Princeton and other parts of this country and they have made enormous progress. For example, the TFTR at Princeton is putting out 10 megawatts of fusion power. That is a lot of power. That is a jet engine worth of power, and within a factor of four of breakeven. When you came on this committee, they were probably getting about a millionth of that much power out. I think a factor of a million in 20 years is not bad.

Mr. MYERS. But if we have a continuous minute flow, it is kind of expensive. And that is not what we had in mind. But I am not trying to blame anyone. We probably here in the committee are as much to blame as anyone for not adequately funding it. It is one of many programs that we are thinking about.

CERN is an example that we need to—do we need to drop out of the international field of exploration and come back here at home and forget all of these others?

Dr. HAPPER. High energy physics has a special problem and that is the discoveries depend on crossing thresholds of energy. And nobody is smart enough to figure out how to cross the thresholds without these big expensive machines. We don't have to do that in chemistry, but in high energy physics you do, otherwise you are not in the game. I think if we want our people to be in that game for the next 10 or 20 years, some accommodation with CERN and the LHC will have to be reached.

Mr. MYERS. This committee has been burned a number of times through bad advice. The fast breeder reactor, we had the thing pretty well built and then we decided that we had made a mistake and couldn't afford it. And then the next one was the enrichment facility in Ohio and we decided that wasn't—the centrifuge enrichment—that was too costly. And then I guess the linear fusion out in California. We decided that. And we have gone down that road so often.

SSC LESSONS LEARNED

And the SSC that we mentioned here, that is where really we got burned. And here again, everyone wanted it. There were very few voices in Congress who were opposed to the SSC as long as we hadn't selected a site. And then you notice when we selected a site, the support fell off from that point and it was never regained.

And ITER's possibility of being built in the United States is not very real, and I am thinking that we have got to decide and make some decisions. And we have got to make it now, it would seem to me, and I came to hear you, and not preach to you, but——

Dr. HAPPER. I have the same view. You are echoing some of my same concerns about ITER and the selection process.

Mr. MYERS. And some of the scientists of the world supported SSC until they realized they were going to pay for it out of their programs and, boy, that went down faster than we thought it would.

Dr. Bernthal, you haven't been in the fusion field directly, but——

Dr. BERNTHAL. Well, it is not my field. I must say in retrospect there are two important factors that led to the problem with the SSC, one that I indicated already is that we should have taken a very careful look at prospects for international collaboration before we set out on that path. In the end, the issue is money, very quite simple issue.

It is fair to say that the scientific community probably overreached in the sense that they underestimated the kind of budget stringencies that we would be under several years into that project. I am not sure any of us really foresaw that.

And it is like many other things that we seem to set out on, we have a terrible budget problem, as you know, better than anyone else, Mr. Chairman. When you are starting long projects, very expensive projects, there are a couple of lessons to be learned there from the SSC experience. Don't go it alone, if collaboration is warranted with other countries. And secondly, one needs realistic estimates of the kind of funds that are going to be available in the outyears.

Mr. MYERS. Along that line, just today we learned that the Department of Energy is going to pull its support for the ANS. We have discussed that in the past too. We fortunately haven't put that much money into it, but there has been real dollars into it.

In your judgment, is that a wise judgment to pull out of the advanced nuclear source?

Dr. BERNTHAL. I am going to defer to Dr. Happer in a moment. It is another one of these decisions at the margin. There are numerous important applications, applications that could serve energy well using neutron detraction techniques. That is what that facility is aimed toward. It would make ours, as I understand it, the leading such facility in the world.

I don't have an easy answer on how you set the priorities, though, among the various projects competing for billion-dollar chunks of money. ITER is one. The advanced neutron source is certainly another. And Will probably knows of some that I have never heard of. It is always a question of setting priorities, but I am not an expert in that field so I wouldn't want to suggest that I am able to give you a statement on whether that is more important than some of the other projects.

Dr. HAPPER. If I may put in my two bits' worth, given that if it were built, it would have probably come out of the base program, small science, and there was not going to be more money, I think they made the right decision. If there were enough money, it should have been built.

Mr. MYERS. Well, if we are going to get cold feet a year or two from now, we better do it now. I used to work for a good old attorney and he often used the expression, if you made a bad investment, get rid of that one and let it go to hell and get a new one. I have never forgotten. He was pretty well right. Of course, you can't always get rid of a legal case quite that easy.

But I think Dr. Bernthal and several have mentioned the fact about our national labs and this has been a concern of this committee too. And contrary to the witnesses that we had when they proposed that we do away with the labs, there is no way that the private sector can do it today under the present tax structure in my judgment.

But nevertheless, I think, Dr. Bernthal, you were critical of the management, micromanaging of the labs. Universities primarily, most of them have been university-managed.

Has the Department of Energy been overmanaging on top of this telling the universities that manage it, to run it, and how they must run them?

Dr. BERNTHAL. It is not unique to a university-managed facility. I think the comments that I made, probably more in my prepared testimony than verbally, applied to all the laboratories. There have been cases where university management of labs have worked extremely well.

In the case of the SSC, I think there was plenty of blame to go around as to why some things did not go well there. But I think there is a degree of consensus and we are going to learn more from, I suspect, the Galvin Committee tomorrow, at least if rumors are correct on that issue of the extent to which DOE in its oversight responsibilities—and I focused really in my testimony on the regulatory responsibilities that DOE, over the years, has come to apply specifically to those research laboratories and the appropriateness of that regulatory activity now that the Cold War is apparently behind us.

And I am suggesting that it would be a more cost-effective operation in those laboratories again confining it to those research facilities to ask them to do what any comparable research laboratory in a university or industry has to do and that is comply with the appropriate law and be under the jurisdiction of the appropriate regulatory agencies.

So that would be one thing that I would point to in terms of moving toward a more cost-effective operation on the regulatory oversight side at least.

Mr. MYERS. Either of you want to add?

Dr. HAPPER. I would just like to say in response to my respected colleague Mr. Conway about the oversight and taxpayers' money, if you compare DOE and the management of its labs, say, with the management of a private industry effort, say GE building steam turbines, the amount of the layers of bureaucracy are so different it is very hard to see how you could compete.

There is no way to compete with a private organization, with the amount of overhead that is there. And so while I recognize that we have to be responsible for the taxpayers' money, it has gone much too far.

Mr. CONWAY. But it doesn't have to be there.

Dr. HAPPER. Your point about the expertise.

Mr. CONWAY. The expertise and there are too many layers of people that need not be there. You need people who are technically knowledgeable and do their job and not have layer upon layer upon layer. No question about that.

Dr. HAPPER. My wife is a school nurse in New Jersey and she has to dispose of syringes, and there are regulations on the books in New Jersey that you have to have a special carter come. And then you fill out a bunch of forms. She is worrying about little kids and at same time she has to fill these forms out.

She gets audited and they say you filled them in wrong. They are all wrong. Do them again. Well, there is another hour or two of work. And so you have multiple layers of people telling you to fill this paper in. And the DOE was exactly the same. And nothing ever gets done. In the meantime, she has got a real job to do. That is what I am talking about.

Mr. CONWAY. I agree with that.

Mr. MYERS. Sounds like the old days at NRC, Fred. Does that sound familiar?

Dr. BERNTHAL. We used to hear the occasional complaint.

UTILITY DEMAND

Mr. MYERS. My last observation for Mr. Conway, we find today that very few utilities are concerned about the future of providing electricity. They are willing to get along today with whatever they have, whether it be nuclear or fossil fuel, rather than take the risk. Part of it is the financial investment that they can't afford, but maybe regulatory that we have spoken about has something to do with it.

Is there something that can be done today to encourage industry to buy reactors or at least talk about it some time in the future?

Mr. CONWAY. I have been out of the utility business five-and-a-half years now and there is a major change taking place today. But when a utility and its board of directors authorizes the issuing of bonds and then investment of, in effect, billions of dollars to build a facility, a nuclear plant or for that matter a coal-fired base-load plant, it has to meet all the environmental restrictions that are placed upon it not only by the Federal Government but State and local governments. When it has to do that, and it gets the approval of its public service commission that it is necessary that in the long view that this plant will be needed, it can take six or seven years to finally get that plant built and in operation. Then the public service commission, with new members on it or even some of the same members come back and say, really, you didn't really need that because suddenly the demand for electricity has not increased to the extent that we were all projecting, therefore you cannot put it in the rate base, and you are going to have to eat that. Now, what board of directors is going to authorize a CEO to take that kind of a chance in the future? And that is what has been happening out there.

And then when there are certain inducements for other than the utility for other power producers to come in and build a facility and the utility is mandated it has to take whatever BTUs or electricity that may be generated there, and sometimes pay much higher unit costs for the BTUs or kilowatts it is receiving, and that independent power producer may in 10 years decide, having made enough money, to leave and does not have the responsibility of meeting the demands and the needs of the customers, that is a pretty tough position for the local utility to be in.

So in today's climate, it is not a happy lot being on the board of directors or being a CEO of an electric utility in this country. Can something be done about it? How did you encourage a utility to come in and invest its money, even in a base-load fossil plant? The most modern plant can you have?

I look upon the adequate energy for this country, particularly electricity, as essential to the national security of this Nation, and its economic viability. And if we are not going to be building base-load plants in the future and the plants that exist today are beginning to become obsolete and wear out, this country could be in serious trouble.

Therefore—I am speaking as someone who worked for an investor-owned utility—I think if we are going to have to build any future base-load plants, including some modified coal-fired plants or nuclear plants, and this may be heretic to the utility industry that I came out of, I think that somebody in the Federal Government is going to have to do it or somebody in government is going to have to assume that responsibility.

I agree with Dr. Teller, we cannot depend upon solar, we can continue making advancements there. It will only be possible to use solar in certain areas and then you can't depend on that for baseloads. Or windmills, there are a few places that have wind that continues to blow at a steady rate. And then when you do find them, you have people complain that it interferes with their TV or their sleep. So there is no way of producing electricity that meets everybody's acceptance.

But it is essential, and I think the United States Government has got to be in a position and that is the Congress and the executive branch, to assure that the people of this country do have adequate supply of electricity in the future, whether the government itself may have to build those plants in the future. I hate to say that but I think that is what I see right now.

Mr. MYERS. I think that is about to happen right now before it gets worse. Thank you very much. And I think when you look at the nuclear industry and the safety record, it is admirable. And other than Three Mile Island—and I don't think even a chicken died up there.

Mr. CONWAY. Dr. Teller had a full page ad in which he said the only person who was hurt at the time was himself because he had a heart attack.

Mr. MYERS. Thank you for your testimony today. We appreciate very much the contribution that you have given to the job that we have ahead of us here. We may be calling on you again. And some of the Members may have additional questions to send to you. And in a reasonable time, we would appreciate it.

The committee will stand adjourned until Thursday at 2 p.m. when we will be in Executive Session.

FRIDAY, FEBRUARY 24, 1995.

THE GALVIN REPORT

WITNESS

ROBERT W. GALVIN, CHAIRMAN OF THE EXECUTIVE COMMITTEE, MOTOROLA, INC.

Mr. MYERS. The committee will come to order and good morning, Mr. Galvin. Thank you very much for coming in today to answer some questions that this committee has been concerned about for quite some time. We both share in that concern about the proper role of our National Labs.

We all recognize the Labs have played a very important role in the history and development of the Department of Energy and some of the developments that have made us competitive in the world, but at a tremendous cost for 25 of them, sometimes in competition with each other. Competition is fine, I think we always need some. That has been a concern of this committee. How much longer can we continue to finance all of them? And what is the proper role, which you have certainly addressed here. So I think each of us, after reading your report several times, have some questions so we are very pleased to have you this morning.

Mr. Bevill is former Chairman of this committee. I often say he handed me the gavel but he took all the money before he left. So we are pleased to have you. Tom?

Mr. BEVILL. I apologize for taking all the money before you became Chairman, John, and maybe things will brighten up later.

I also welcome you and I am anxious to hear your study. And Mr. Chairman, do you want to let him testify first and then—okay, you will just give me a break here.

Mr. MYERS. Thank you. We apologize to you, Mr. Galvin, for the inconvenience here of having to start late. We were here, but just as we got here ready to come in to start the proceedings this morning, why, we had a record vote on the Floor and you all—you all, I talk just like these southerners do. I have been around them so much, I say "you all."

Mr. BEVILL. I have been a bad influence on him.

Mr. MYERS. We have a constitutional responsibility to vote also, so we had to delay. So we apologize to our friends here who have come here, Mr. Galvin also.

Mr. Galvin, your statement—I think you have a statement. Proceed as you care. If you have a statement, prepared statement, I am sorry, I didn't see, what did you have? I read your report, but I haven't read your statement. That will be—in its entirety—printed in the record and then proceed now to summarize wherever you care. It is all yours.

OPENING STATEMENT OF MR. ROBERT GALVIN

Mr. GALVIN. Thank you very much, sir. I appreciate the privilege of being here and I would appreciate the privilege of reading a very brief statement which is uncommon for me. I typically come and extemporize, but I think that the statement that I have here this morning might help to seed the discussion between us and further amplify your interest in certain questions, and with your indulgence, sir, I will read this in a very short time.

My name is Bob Galvin and I am the Chairman of the Task Force on Alternative Futures for the Department of Energy National Laboratories. We were requested by the Secretary of Energy's Advisory Board to prepare these proposals over a period of one year.

I am a businessman who has spent 55 years with one high technology company and have rubbed shoulders with scientists and engineers in that capacity and in a variety of pro bono jobs at the Federal level.

The 22 members of the task force were named by the Secretary. Their competence is exceptional. Most devoted extraordinary time. They brought related sophistication, firm forthrightness and convictions, as well as collegiality in bringing synthesis to this subject. Though each of us retained certain biases, we found no need for a minority filing and have substantial agreement on the issues.

The task force respectfully suggests that the only way to fully understand the aggregation of its 80 to 100 proposals, depending on how you classify topics, is to study the entire text.

I thank you, sir, for having alerted us to the fact that you have read the text. That is a great value. We did not compose an executive summary because the broad and integrated factors cannot be usefully summarized in sound bytes. However, as a guide, we provide a special extra copy of the text which I believe has been provided to you. This is an evidence of it. It has underlinings that allow a first scan to get the flow and location of topics. We prepared this for announcement day introduction efficiency. It may assist you, as well as this document, that lists the multiple suggestions in a shorthand litany keyed to the pages.

The futures for the Laboratories should and do derive from the past. They have been and are a national security role, an energy role that includes environmental factors and related science and engineering, an environmental cleanup role, a science and engineering role, an economic role, though with deemphasis on general industrial competitiveness.

The primary national security mission is to provide for a safe, secure and reliable nuclear stockpile in the absence of explosive testing for nuclear weapons and many other derivative and decommissioning factors.

The primary energy mission is to pursue a research and technology development agenda which enhances the long-term prospects for adequate energy supplies and efficient end use technology which minimize adverse environmental impacts.

The environmental cleanup role represents a monumental task in dealing with the radioactive and hazardous wastes at former nuclear weapons production sites and Laboratories. This task cannot be addressed in an affordable fashion using today's technologies. The National Laboratories have and can develop the technology which is urgently needed for cleanup missions.

The National Laboratories must serve a broad scientific and engineering mission which underpins the Department's above-cited mission areas and certain discrete areas, such as high energy, nuclear and condensed matter physics.

The economic development role should be focused on those parts of the economy and industries that fall within the basic mission areas. Any other general benefit should be viewed as a derivative from the core missions. Development of technology for private sector companies in other areas should not be a prime mission.

We take some 50 pages in our report to expand and elucidate on the substance and the subtleties of the missions just related.

Four obvious audiences of this report are the contractors, the Laboratories, the Department, and the Congress. To help seed the discussion at this hearing, let me distill some elements of this report addressing each of these audiences.

To the contractors, we simply say, you universities or private sector entities do yeoman work. You may serve in various capacities in the future.

To the Laboratories we say, you are important. You are capable. You must emphasize broad-based R&D long term, but you need better focus within your core missions. You must be allowed to renew at the periphery of your missions. You Lab directors have to have a greater discretion on new R&D related to those missions.

Your work should be balanced with university research and you should coordinate with industries that relate to your missions. But you should act more as a system, approach being a single virtual Laboratory. Establish lead Labs. You should net your computers further. You should establish centers of excellence. You should be allowed to operate to quality systems like industry. You can improve functions. You can shave redundancies. Many dollars can be saved if you are allowed to operate through the efficient standards that we know you can ably manage.

Your national security budget can be resized. Lawrence Livermore national security missions can be reduced. You should continue to do nondefense R&D. You need not report to the Department of Defense. Continue R&D on accelerator-based production of tritium. We would like you to have a greater role in the environmental remediation science and solutions and be available to all. You will profit from using more technology road maps and you are capable of being worthy of greater trust in a new governance system.

To the Department we say, you have been pressed into a micromanagement role. You must get out of the Labs' way. The Labs' quality systems must be allowed to flower. Major Laboratory facilities and equipment, some of which we list in this report, deserve full support. There are many energy potentials and these must be prioritized. Stay a positive course on fission energy. Better integrate R&D and remediation and plan for further cooperation with others in this assignment.

Establish an Industrial Ecology Board. Establish an Environmental Advisory Board. You will have to renegotiate the environmental agreements with communities and States and must find a way of convincing our public to balance risks, the reality of the possible, and of course your dedication to a sense of urgency regarding cleanup.

Sustain and emphasize your dedication to long-term research and development. Deemphasize industrial competitiveness outside of prime mission areas. Redefine CRADA standards, the what and the who that are allowed as CRADA partners. Reduce cost recovery fees. Fund facilities separate from programs at least until the governance issue is settled. Radically streamline your management and upgrade the remainder personnel in their new roles.

To you the Congress, our message is direct. First, we encourage you to embrace a major energy agenda for the country and reconfirm the support for the national defense objectives which will be obligations for a minimum of two score years. Hopefully, you will support the Laboratories and the Department on these duties and missions already recited, but we particularly bring to your attention that the system of governance of the Labs is broke.

The Laboratories did not break it. In the Task Force's judgment, the responsibility rests first at the feet of the Congress and second at the feet of the Department. Congress has mandated too much of the how to, too much of the details of what to do, too much accountability. It breeds micromanagement, and has intimidated the Department to oppressibly impose excessive accountabilities and micromanagements on the Laboratories.

The real waste in the system is derived from the above. This as much as doubles the cost of what could be an efficient and an effective Laboratory system. The primary organizational recommendation of the task force is to corporatize the Labs. That is described in some detail in the report.

The Congress should set broad objectives and let the Laboratory professionals do the rest. The Congress must find a way of showing its endorsement of quality systems as the private sector has been learning to do. This involves getting out of the way of the doers. We recommend that you allow a studied, clean-sheet of paper approach to a better system including general block-like funding over multiyears as a modest size, progressive experiment in how Federal functions might better be achieved in the 21st Century. That will be a global century and we encourage inviting foreign funding in the Labs and relaxing that policy that substantially limits the use of R&D results to only the United States.

We make no recommendations closing Labs or moving any to the Department of Defense. We believe you should support repair and modernizing of the facilities.

This governance proposal is acknowledged to be bold. It is our preferred solution versus the continuation of the GOCO system. But if the GOCO system is obliged, the second appendix in our report specifies the changes that can contribute to some renewal of the vitality of the system. The evidence of the faults in the system are illustrated with a few of what could be thousands of anecdotes in the first appendix.

We urge the Congress to take a fresh, bold look at enabling the Laboratories to serve their important future responsibilities in a more effective and efficient way. Thank you for the privilege of presenting this orally.

[The prepared statement of Mr. Robert Galvin and the Report of the Task Force on "Alternative Futures for the Department of Energy National Laboratories," appear at the end of the hearing record.]

TASK FORCE PROCESS

Mr. MYERS. Thank you, Mr. Galvin. First, in the structure of the 22 co-members of your commission, I guess you were commissioned by the Department of Energy, at least your committee. We have examined and appreciate the expertise, but how did you—did you have subcommittees and have hearings or how did you go about bringing all this information to your attention?

Mr. GALVIN. You have exactly determined our primary modus operandi. We very quickly organized into subgroups, and there was a subgroup headed by a subgroup chairman for national security. There was similarly such for energy and its related factors.

Similarly, for remediation and the same chair and a mix of people were subgrouped on the issue of science and technology and on industrial competitiveness. And a chair for the governance issue. So, yes, we did distribute our responsibilities. But we homogenized ourselves substantially.

There was a great deal of cross-referencing and cross-mixing and an immense amount of travel to Laboratories, meetings with special peoples on their particular focused subject matters, and we had an inordinate number of plenary meetings among ourselves. Of course, a very large number of public meetings to comply with the appropriate regulations.

Mr. MYERS. Now, were you completely independent from any influence from the Department of Energy? Did they just say, here is the ball and you carry it or did they try to tell you what they wanted in your report?

Mr. GALVIN. We were absolutely given free reign. We were given some objective inputs from people in the Laboratories as informational resources. But we were never subject to any kind of an influence as to the direction that anybody wanted the course of our studies.

LABORATORY MICROMANAGEMENT

Mr. MYERS. Well, the GOCO organization we have in the Labs now, we thought, was an improvement than it was originally. It somewhat insulates the Lab from—and their operation from direct influence or direction from the Department of Energy. I guess it hasn't worked. You say it is broken. We recognize that it is wounded and has a fracture, but—the system, the Lab system, but I am not here to debate you. We appreciate you, but we had never come quite to the conclusion it is completely broken, but possibly it is and we appreciate your views on this.

But the thing that concerned me somewhat is the fact that you, in your report, were critical of micromanagement by both Congress and DOE, but on the next page you say they didn't have enough supervision and enough management. I kind of get confused about just what clearly you meant by this.

Mr. GALVIN. Let me correct whatever that impression would be. Who is speaking? I am rhetorically speaking to myself. The task force says the system is broken and should not have near the micromanagement, but the Department, in speaking its objective views of things, in effect always comes back and seems to need more people to go in and manage.

Mr. MYERS. We have noticed that.

Mr. GALVIN. And even as recently as December, only two months ago, when it announced its performance-based contract system which is purported to be an improvement, and you will find contractors who will like the fact they could write their contracts to these new criteria, you find that in the announcement which goes on and on and on. It is multipages, just the announcement. It, in effect, says, of course, we will have to train many more inspector generals and many more auditors in order to manage this new system.

So every single piece of evidence, without exception, that 22 of us had from talking to the Labs and talking to the people in the Department were very open with us, is that every engagement adds more administrative cost and administrative time to the situation. That is why this system, in our judgment, is broke.

Mr. MYERS. I believe I remember your report. You visited five of the Labs; is that right?

Mr. GALVIN. We were to take cognizance of 10 Labs and many of us visited all 10 Labs, often multiple. I mean, we got there more than one time.

Mr. MYERS. Did you visit and interview each of the directors of the various Labs?

Mr. GALVIN. Extensively, extensively.

Mr. MYERS. Every Lab was included in your report.

Mr. GALVIN. Every one of the 10 Labs were visited and we met in collective group with Lab directors. They were very open. They were always available to us and/or we met singularly if that was the appropriate way for a certain visit to have been accomplished.

Mr. MYERS. Well, I think we all would agree that the Labs have not done the job for the money we have invested in the Labs in the last few years. Maybe they never did. Maybe as we grow here, we see more and expect more. I think maybe we are inclined to do that, too, but the thing that does bother me is your suggestion here, and I will get into specifics, I have to go around to everyone here.

I am more interested right now in how you came about producing the product that you did, and I appreciate the fact you had no Minority views. I don't think this committee has ever gone to the Floor with a bill that we had Minority views.

We try to resolve all the differences here, too, and I think there is much to be said. If you can do that, it is much more successful, but I have not seen any report that any of your 22 members have even to the press said that, "Well, I didn't agree with that and we should have done something differently," which also speaks well of the job you have done by putting this together.

But one thing that—in specifics now, could corporatize, you mentioned that England has corporatized—maybe privatized, whichever, somewhat different here, but their Labs, I think they have more than one. Did you examine just what Great Britain has done with their Lab?

LABORATORY SYSTEM

Mr. GALVIN. May I comment in some sequence to what I have said and I will get right to your end question very promptly.

If you will permit me to put my rhetoric alongside your rhetoric, sir, and I respect your rhetoric, you started off by saying that the Labs have not been able to produce apparently what we wanted done. It is the Laboratory system, sir, that I suggest be the focus of your committee.

It is the system that starts with the Congress, that goes through the Department and then to the Laboratory. The Laboratories are themselves not broke. They didn't break the system. They have had imposed upon them circumstances that are just breeding tremendous confusion and demotivation and reduction of efficiencies, overhead cost, that they would not have absorbed or taken on themselves. It is the system, sir, that we are focused on. At any particular point one, of course, should look at an individual Lab.

With regard to your question as to whether or not we found a clone, by mentioning something like the fact that the British have more privatized, and I think that is their word and I want to come back to corporatized in a second, all we wanted to do by signifying that there have been variance or precedences, we are doing something different than whatever we call the Federal norm. We mentioned lighter and darker and odds and ends; not to just say that any one of them, and the British is not intended to be such a clone, and we didn't study this in detail. That is the answer to your question.

We merely took cognizance of the fact it took place, is that we are saying we would—we invite you, encourage you to be willing to take a fresh look at what we call the clean sheet of paper, something that has never been done before. Only justified by the President that we should be willing to try something, but in this case, be progressive in terms of saying, we will allow for the review of a potential system that we call corporatized. Let me differentiate now between privatized and corporatized.

In all probability, whatever you would end up allowing to be done, the Federal Government would, in effect, own the institution. It would own the land, own the buildings, et cetera, and the—and an analog would be that the Federal Government, we, the citizens, through our Federal Government, we would be the shareholders. You are the manifestation of that shareholding.

CORPORATE SYSTEM OF MANAGEMENT

Mr. MYERS. We are the directors—we wouldn't be the directors. We don't want that.

Mr. GALVIN. You are the shareholders. Now, you allow that there will be a board of directors. We call it a board of trustees. We put a lot of emphasis under this term "trustee and trust." I don't know whether you will ever want to talk about that very much.

It is essential to what we are dealing with. We see a board of trustees appointed by somebody, the President, multicycle of membership, et cetera, and that these people, as is the responsibility of all such boards, they appoint the management and the management is the management of the Laboratory corporation, which would be a nonprofit corporation and would be subject to essentially the same class of regulations that the company that I have been with for 55 years or any others like us are subject to. No other special micromanagement. No other proscriptives and the world gets along very well with the standardized overseeing of private corporations, but we call it corporatized versus privatized because the private sector will not take ownership, at least at this stage.

I don't know what would happen 25 years from now. Maybe this will evolve into something even different a long time from now. Maybe we will have you people——

Mr. MYERS. Mr. Bevill will still be here, but some of us may not.

Mr. BEVILL. Strom Thurmond and I plan to be here.

Mr. GALVIN. I threatened that in our company. I say, unless you people solve this problem, I am not leaving. God, they go to work.

Mr. MYERS. I wouldn't tell my constituency that. Wouldn't dare.

Well, Mr. Galvin, I should have explained to you. Each of us will take five minutes on the first round to question or talk to you about it, so at this time I yield to Mr. Bevill.

Mr. BEVILL. Thank you, Mr. Chairman. I am going to yield to Mr. Fazio who has a very urgent meeting to attend here in a few minutes and I will just take my turn later.

CORPORATIZING THE LABORATORIES

Mr. FAZIO. I want to thank you, Mr. Bevill, and I thank you, Mr. Chairman. First of all, I wanted to say, Mr. Galvin, how much we appreciate the fact that you, not alone, but certainly as a leader in the corporate world, have invested so much of your time in helping promote basic research.

I remember your leadership role on the Supercollider, something that this committee looks back on with mixed emotions I might say, but we really do appreciate the fact that you have been willing to take time out of your private life to invest in the public good, knowing how integral it is in the creation of Motorola and other corporations that have been so successful in the private sector.

And I am interested in the corporatizing concept, because I think it is a way of perhaps insulating the Laboratories from what you have referred to as the micromanagement of the Congress. I am sure that is part of what you are trying to do.

Mr. GALVIN. It is.

Mr. FAZIO. Have a board of trustees of wise men and women, hopefully, in a position of guiding the Laboratories. Could you cite for us where you think our micromanagement has been most evident and perhaps most counterproductive?

MICROMANAGEMENT BY CONGRESS

Mr. GALVIN. Yes, I think I can maybe do so by generalizing. In talking with very competent members of staffs and of House and Senate committees and introducing the potential that there might be a bold change in organization, it seems to be—they come back with a generalization that say, you must understand the political environment in which we exist, that if an article appears on the second page of the Washington Post that suggests that some money has been spent apparently incorrectly, my Congressman and my Senator cannot afford politically to have that kind of potential embarrassment, even if it is de minimis, and therefore, we have to have an assurance that every manner of accountability has been seen to so that we can defend ourselves politically that we never let a dollar of the taxpayers' money be misspent, even if it costs us 10 times or 100 times as much to be sure that that dollar wasn't spent, and that pervades the system, sir.

All those who speak up to us, even in the Department and in the Laboratories, I see 100 percent. I don't know anybody who has talked to us who didn't say this, say that their impression is the Congress is so insistent and will be so disciplinary to people that come up to be heard by the Congress and will go back to their office so shaken by the intensity with which you are insisting that they be sure they don't waste one penny, that you are beginning to paralyze the system, sir. That is how you are perceived by everybody.

Mr. FAZIO. Well, you know, self-criticism is something that we periodically engage in, but usually avoiding direct contact. It is something we talk about in terms of the institution or the other party or some other committee, and by the way, I am glad you are speaking to the Science and Tech Committee in the coming days and weeks, but I think this committee, because appropriators tend to get into this more, whether we like it or not, needs to be willing to consider this sort of thing. And I think your analogy to reacting to criticism, which is part of what we do in order to deal with our constituents, is a valid concern, so I like the concept of taking a step back in a sense and letting others provide the management oversight.

Can I ask you a bit about the National Ignition Facility? I know the report does touch on that in positive terms. I wonder if you could speak to that issue for the benefit of this committee.

NATIONAL IGNITION FACILITY

Mr. GALVIN. I can in general, sir, but I tell you very simply that I am not an engineer and, therefore, I cannot give you a simple synthesis of a scientific basis. But the excellent people on our committee who are fairly informed about what that science is all about, had a large number of Ph.D.s, noble laureate scientists in our group, generally came down on the side that this will be a very valuable research tool, and it is an excellent tool for national security engineering and scientific investigation as well. And just as there are many other fundamental tools in various parts of the Laboratory system, this was looked upon on balance as an important new tool to possess, and so you did see that on balance, trying to consider all the politicals and the internationals and factors of that nature, that our committee endorses the decision to proceed with NIF.

Mr. FAZIO. Mr. Galvin, I have a number of questions I would like to ask you and I don't have time and neither does the committee, so I hate to burden someone who has volunteered so much, but if we could place some of these questions in the record, would it be possible we could get some additional enlightenment on a number of them?

Mr. GALVIN. Yes, sir. I will be pleased to respond to every question and incidentally will be responding as a spokesman for the task force. I am not here with any private separate agenda. I am attempting to faithfully respond, as I believe is the consensus or almost the total collective view of the task force. We will answer every question accordingly.

Mr. FAZIO. I appreciate that. It goes without saying that that would be the basis upon which you would respond and once again, I would like to thank you for your continuing public service.

Mr. MYERS. Thank you, Vic. Mr. Rogers.

Mr. ROGERS. Thank you, Mr. Chairman. Mr. Galvin, we deeply appreciate your being here today and more importantly, we appreciate the role that you are playing and your willingness to do this for your country. We think that you obviously, and your colleagues, have done lots of work and lots of thinking and for that, we are also very deeply thankful.

Now, procedurally, what happens now? Your report has been made to the Department, and what is the likely executive action that would come from your report?

PROCESS FOR IMPLEMENTING RECOMMENDATIONS

Mr. GALVIN. I am generally, but not necessarily thoroughly informed, sir, to be a credible responder. The Secretary and her senior people take cognizance of this report and some other matters that they are having reviewed. They will obviously come to their opinions as to agreeing or disagreeing with parts of our report.

Among other things, and I believe they are responsible to act on, is to ultimately present, partly driven by our report, but they are not obliged to be for any parts of our report, a contribution of the department's position with regard to a national science and technology policy that is being drawn together by Jack Gibbons. He is asking for similar opinions, I think from the Department of Commerce; I know from NASA and probably from the Department of Defense and if I haven't identified those with precision, I apologize.

The administration is then intending to take all of these thoughts and come up with their position with regard to a systems approach or a general analysis or an overall position with regard to science and technology.

Mr. ROGERS. The Congress is not very good at doing what you want us to do. We are not very good at, on our own, coming up with a major energy agenda, as you recommend just because we are—we are not made to do that type of thing.

The initiative for that would probably have to come from the administration, from the executive branch, where they have put together, with people like yourselves and their employees, a proposal that the Congress can then dispose of. So I would hope that the Department would follow through with what you have recommended and present to the Congress a major agenda that is bold and that follows a lot of your recommendations so that the Congress can then exercise its judgment about that, perhaps amend it, change it to some degree.

You say to the Congress in your report that we should embrace a major energy agenda. What do you mean by that?

ENERGY AGENDA

Mr. GALVIN. First, we signify in our document that energy is a sine qua non. It is absolutely vital to the quality of life and the total consequence of our free republic and that over the decades again, and this has to be a long-term look. We have to be very sure that the United States unto itself has sure sources of safe, abundant and low-cost energy and all of us know that there can be some finiteness with certain availabilities of fuel sources, et cetera.

The efficiency and the productivity of our society is dependent on energy. We can't take it for granted.

Further, that the energy consequences around the world are going to be determinative as to our quality of life as well. Imagine, if you will, sir, that everybody else in the world wants the same amount of energy that you and I have available to us and they are going to get it in due course. Are they going to get it clean? Are they going to get it efficient?

Is there going to be an opportunity for American industries that serve the energy marketplace to be competitive in that world market, and also to be the influencers of the cleanest energy for the effect of Mother Earth?

These classes of things are the drivers as far as we are concerned. Literally, you can introduce an issue from almost any platform, but energy, energy sources, energy efficiency, energy cleanliness is essential to the running of this Congress, the running of our companies, to the living of our homes.

So that is what we mean by an energy agenda, and the sciences required to unravel the next levels of efficient and clean energy are immensely sophisticated. They are down to the microelements of nature and we are going to have to know more, and more, about the subatomics, not necessarily because we are dealing only with nuclear energy, but it is the understanding of the building blocks of nature that make it possible for us to have an efficient society.

So the term, "energy agenda," which we hope doesn't become a slogan, but just becomes a concept, is something that we think is similar to our affairs, and incidentally, has to be in some central sponsored way dealt with because the problems are so fundamental, so long-term, and even in many instances risky—not risk-safe, but risk-economic, that it takes a central support in order to see ahead in the basic sciences.

Mr. ROGERS. Well, there is no doubt in my mind certainly that there needs to be over the Labs some sort of governing and cohesive agency or whatever you call it, that does coordinate the activities of the Labs and roots out—eliminates duplication, inefficiencies, waste, and coordinates some sort of policies between the Labs.

I don't know whether the Congress would be willing to appropriate $6 billion for the Labs that are under the direction of an independent board of directors. That is a—would take a pretty strong stretch for us to get there, but perhaps we could.

Is there—two questions then. What is your alternative to that proposal in case we can't go quite that far? And two, can you name another time that the Congress has done a similar type of thing, creating an independent Lab over such a very critical mission?

MODEL FOR CORPORATIZATION

Mr. GALVIN. With regard to your last question, sir, I do not think that there is any clone of how Federal policy has done anything approaching what we are suggesting, so in that regard, I cannot prove that it didn't work or prove that it would work.

What I think I can draw the analogy for is that you have depended very substantially on the private sector to win the Cold War in every other regard other than nuclear weapons, and I think the private sector has done a rather distinguished job in that regard.

Lockheed builds your airplanes and somebody else builds your submarines and we build your radars, et cetera, incidentally, with all too much obfuscation of regulations, but that is a separate issue as far as I am concerned, as far as we are concerned here. You would get a lot more with less regulation from even the Department of Defense and I think the Secretary would be glad to tell you some of those things.

But I respectfully suggest, sir, that the people that you are going to be calling upon to be the trustees at all, they are our fellow citizens. I think they are just as trustable as anybody else.

Can you imagine a board of trustees populated by the David Packards of this world? David Packard has already served his country with distinction, but there are plenty of them around. You can trust them, and in the private sector, sir, the thing that we are learning is that the more we trust our people, the more efficient we become, the higher the quality of ethics, integrity, performance, et cetera. And, yes, that would be a new thing for the Congress to do because you have been built on the principle of governance. We got to check up on things. I say experiment.

Incidentally, you won't have to spend $6 billion in the long run and you will save an immense amount of the Department's budget, which we don't even talk about here except in very general terms.

So you will get in that colloquialism, way more bang for the buck, if you will experiment with this and prove something that maybe will be very good in some other veins for the next Congress to consider five or 10 years from now.

Mr. ROGERS. Well, I thank you very much. I am sorry we are limited to five minutes each, but we are.

Mr. MYERS. There will be a second round. Mr. Galvin, you mentioned about industry being overregulated. That is what we are considering on the Floor right now, just how much overregulation we have not only in industry, but as individuals into our lives. Some bureaucrats make a decision for us that we can better make for ourselves more efficiently.

Mr. Bevill, I will recognize you again now. You didn't like it the last time.

DUPLICATION OF LABORATORIES

Mr. BEVILL. Thank you, Mr. Chairman. Mr. Galvin, I think this task force looking over the makeup is certainly a very impressive group and I think you have made a great contribution here to the country, you and this task force in what you have done.

I believe that the initial charter of the task force included addressing options involving the possible redirection and restructuring and/or closure of elements of the Laboratory system. The only specific direction I see was the movement of weapons design capabilities at Lawrence Livermore National Laboratory to Los Alamos National Laboratory.

Was that the only duplication that you found in the Laboratory system? You know, we have, what, 25 Laboratories I believe you said, and then, of course, these are two that are primarily weapons research, and—is that the only duplication that you found in the Laboratory system that you recommend?

Mr. GALVIN. No. We found considerable redundancy and—in the text of the document, sir, the—lots of pages that are there, there are both general representations and there are appropriate implications along that line. We are not trying to be subtle, but we obviously couldn't go into detail after detail.

We spell out the Lawrence Livermore situation because it was such a prominent, current event during the time that we were doing our job, that we had to have an example of the kind of recommendation that somebody should make. Ours may or may not be the right one, but we wanted to give you a concrete example.

I respectfully suggest, sir, that among other things, if you were to have your staff use as a checklist this particular eight memoir document which I referred to earlier as—I think it has about 120 line items on it, I think you would find that there are 8 to 10 representative things that suggest this would be another change in the Laboratory. Our report is replete with changes to be made in the Laboratory, but they are refinements.

Now, one general thing that we ascertained and always sensed as we were deeply involved with the Laboratory people and the Department people was that all the Laboratories were generally out in an almost a more physical way, all looking for new missions. As of last February, versus now they are beginning to say, no, we know we have to focus more. But when the Secretary sensed, to her remarkable sensitivity, that there ought to be a study—remember, she initiated this and that was very brilliant of her, but I got to find out what is going on here a little better, we went out and discovered that from all manner, people were beginning to look at all, a more physical kinds of—what other missions can we get in. Everyone wanted to get into everybody else's mission for a temporary period of time.

By the middle of our study, I don't think we were necessarily all that influential, but certainly studies cause focus. People were beginning to say, I guess we really do have to start focusing more.

So replete in our study, sir, if you get into the details, there are many specific recommendations with regard to moderations of the Laboratories themselves. But I would like to just add one more thing. That doesn't—you know, if institutions are exploring things, that doesn't mean they are broke. That is not the brokeness of the system. It is the other things we have already dwelled on.

The Laboratories can do a lot of things about becoming a virtual Lab, centers of excellence, focused on one subject more in one Lab than maybe in another, network better together, eliminate a couple of projects that they don't need to have. They don't close the Lab, but they can close a project and it gets—other things.

There are probably 8 or 10 references in this report that says there ought to be more support of certain parts of the science. This isn't just a, let's keep cutting back. So even though we say, for example, in this document, we think for today's defined mission, the Laboratories are oversized, quite aside from the fact they have been obliged to put on too many complementary auditors, et cetera, that it is oversized just for the technology.

There are new things in the energy agenda to which you ought to seriously consider giving them some support. Not just to fill up the jobs, but because there is a big job to be done for the country.

TECHNOLOGY ROADMAPS

Mr. BEVILL. You mentioned the development of technology road maps in your statement. Could you describe what you mean by technology road maps and the process used to develop them?

Mr. GALVIN. Yes, sir. That one happens to be quite personal to me. I was the suggester of that one, but the group bought the concept because they all knew it fundamentally.

A road map, sir, is a very sophisticated checklist, and in science, it is possible, though, you can't predict the most extensive new discovery in nature at all times. You can predict what you ought to be working on with some degree of assurance when you put all the sophisticates together and say, this is what we can do today and this size, I think we can make it smaller, I think we can do it faster, I think we can change the specifications here.

And if you will forgive this very important example, our company started using road maps, which are very sophisticated expectations of what we need to do two, four, six, eight years from now, not just a new product line. We took it to the semiconductor industry and the semiconductor industry now has the most sophisticated road map of any industry existent.

There is a case where we can point to the clone of the value of having a generic road map for a whole industry that is very honorable, very nonantitrustee, it is all very progressive for marketplaces. It is all precompetitive, and what we have in effect said is that that can happen with all manner—many, not all, but many manners of the technologies that the Laboratories are a part of.

Now, once you get a master road map for let's say fissionable energy or for wind energy or photovoltaic energy or what have you, now you have got a chance to really focus. You have a reason for deciding to do something. So here is a tool that would help bring order out of what the Department should want versus some compartments in the department that say, gee, this looks like it is a good thing. I am all for that, or maybe one of your constituents convinces you that it is good, and it probably is. But the road map gives us a systems analysis of the expectation.

Still have to allow for surprises. You will have to allow for the fact we couldn't think of everything for the future, but I respectfully suggest, even though it is a detail, hell of an important detail, that if they use road maps, it will help bring greater order and efficiency to the system.

Mr. BEVILL. Thank you very much. Thank you, Mr. Chairman.

Mr. MYERS. Thank you, Tom. Mr. Bunn.

ACCOUNTABILITY

Mr. BUNN. Thank you, Mr. Chair. As I look through the testimony and listen to what you are saying, it looks like you are saying that we are oversized. We need to resize our Labs, but not close any Labs. We don't seem to have a clearly defined mission, but we need less congressional oversight.

I am concerned that things we are not supposed to micromanage, but we have NEA and NEH which, because we leave hands off, we have people come in and say you should zero them out. How are we supposed to provide funding and not have accountability and have the taxpayers find it acceptable?

Mr. GALVIN. Well, I think accountability comes in a variety of ways. Let me give you an analogy, sir. I can recall a discussion with a very distinguished and able Federal employee, an Inspector General. This Inspector General said, Mr. Galvin, the only thing that I know how to measure to assure that there is some accountability is whether or not the Department is following the accounting and the environmental regulation processes.

I don't know how to evaluate the quality of the science. So process becomes the surrogate for evaluating the most important output of the Laboratory, which is the science. And in our document, we refer to the fact that if we will focus on and learn how to evaluate qualitively what the Laboratories are producing, that should become your valor primary focus with regard to accountability.

Do not pretend that just knowing that a certain accounting process was followed, that that is accounting for the fundamental results you expect from a Laboratory.

So you would have to learn a new class of factors. I don't mean that you personally, sir. The Federal system must learn a different set of factors as to what accountability is.

I respectfully, again, come back to the proposition that as soon as you say to a group of your fellow citizens who would be your trustees that you expect them to orchestrate the principles of integrity, the ethics, the accountabilities, et cetera, and to be monitored by public accountant firms like an Arthur Andersen or what have you, I respectfully suggest, sir, you would have a very high integrity system and you would get benefits probably to the tune of almost twice of benefits you are getting today for the dollar you are spending.

ROLE OF THE PUBLIC SECTOR

Mr. BUNN. You talk about getting out of the way of the doers, encouraging foreign funding of the Labs, and reevaluating the R&D results for the U.S. only. Instead of just getting out of the way of the doers, should we just get out of it, say let private industry deal with it and if that is not the role of the government, if we can't identify the mission and we are wasting taxpayer dollars, just stop?

Mr. GALVIN. That, of course, is a very perceptive factor to look at. As science looks from, in effect, zero to infinity, should you actually go to the—should one go to the degree that you have just articulated.

In our document, if you have a chance to read the whole, we go out of our way to say that we would not like to have our advocacy for changing governance be an excuse or a stimulation for somebody to think that there isn't a long-term support responsibility obliged by the public for this very central thing called the energy agenda and the stewardship of our nuclear weapons history and future. These things, I think, have to be centrally done. It is not a case of industrial national strategies or something of that nature. We come down 100 percent on the side that this must continue to be a generally supported Federal responsibility.

It is not inconceivable, as I hinted back about 20 minutes ago, that if you move to corporate sayings in this era, by the middle of the next century, who knows? We may have found a way that this could be afforded by the private sector. Some of our corporations, in the next 40 to 50 years are going to be trillion-dollar corporations and maybe we could afford it then. But you can't find anybody that could afford the fundamental science, investigative burden cost, opportunity that society needs at this time. So I would hope it doesn't lean towards what you articulated, sir.

Mr. BUNN. Thank you.

CORPORATIZING THE LABORATORIES

Mr. MYERS. Thank you, Jim.

Mr. Galvin, there seems to be still a question about just how we put these corporatized—and I think—I don't think there is—as you say, there is no clear clone someplace where we can take a look at experimenting with it.

Would you bring all of the Labs under the same corporatizing or would you try a few of them, maybe the 10 right now that you have mentioned here to see how it works or what would be your recommendation?

Mr. GALVIN. Thank you. First off, let us do be sure that there is clarity with regard to the number 10 and the number 25. You are right. You both have referenced the fact that the Department of Energy has many Laboratories. Our only cognizance was 10 Laboratories. Maybe there is some general point that you could have—our thoughts would flow over to the 11th or the 22nd Lab, but all we speak to, sir, are the 10 Labs.

With regard to the fact that we are general in our statement with regard to corporatized versus giving you a formula, let me parenthetically insert the following: That as a service to our—to the task force's memory, because we are now decommissioned as a task force, as a service to our country, I have commissioned separately a review by certain professionals to see if they could come forth with suggestions worthy enough eventually to present to you.

I don't have them today, to you or anyone else in the Congress, some more specific ideas as to what you might do if you wanted to consider this. At a given point in time, if I have anything useful in that regard, I will share it with you. So that is a possibility, but the essence of what we are suggesting is that because the private sector has learned so much more in the last 10 or 15 years about how to manage laboratories, how to get—how to let the lab people do the work and the rest of us get out of the way, that we are just almost universally, in our committee, of the mind that this is going to—when we finally find that clean sheet of paper approach, to experiment with, that you would automatically get over an early period of, say, the second or third year, an immensely improved productivity of the labs, which already are doing their damnedest to do a good job for you, as long as they aren't interfered with too much by this micromanagement.

Mr. MYERS. Well, the so-called GOCO system of operation was something we tried to approach. What you are recommending here, by letting the Labs be managed by either universities or private corporations and some—a couple of them we have tried both, seemed not to have worked then. It is going to be very difficult to ever break away today without making some radical changes, it seems to me, in the whole procedure.

As an example, if we should corporatize, wouldn't it—come a point where these—the director—you don't call them the director, the trustees would say, you have to show a profit. We must show a profit next year, and really the Labs were never ever organized or designed to make a profit, but to produce a product that the country needs for defense, national security and for security as well as providing future needs for energy. So it seemed to me like we might go too far and go over to the point where the Labs would be required to make a profit. They would be more concerned about their financial statement than they would be about producing a product and having us as customers. Is there that danger?

Mr. GALVIN. That could very well be a concern that should be well thought out and anticipated in terms of attenuating any risk therein. Obviously, we start out by at least using rhetoric that describes this as a nonprofit corporation. That set of words is printed in the document. There are many nonprofit entities in our society. The world has learned how to operate corporations not to make a profit. Obviously, they are more pro-bonoish type of institutions, but the fact is the culture is there.

Mr. MYERS. We know a lot of them.

Mr. GALVIN. But the Laboratories do not have to have a profit motive to be a great service to our society, and I respectfully suggest, sir, that the Laboratory directors are sufficiently encultured to know how to operate efficiently, but without having to have the motivation of a profit.

Mr. MYERS. Nothing wrong with profit.

Mr. GALVIN. And there is nothing wrong with profit.

Mr. MYERS. That is right.

Mr. GALVIN. But this isn't the place where it should be the standard. You must expect it from we, the private sector, otherwise, but in this corporatized approach, it isn't essential, and I think the Laboratory peoples who are themselves very talented at managing as well as sciencing, they could learn this increment of culture very readily.

A board of trustees can do that. We do it with universities. We do it with other kinds of institutions. All of us have some experience along that line. I would be the first to say that you should be watchful of that. I think it is entirely manageable.

EXCESSIVE OVERSIGHT BY THE DEPARTMENT OF ENERGY

Mr. MYERS. In a colloquy earlier with Mr. Rogers you explained that there was a paralysis in the Labs today from over demands and as I am reading your report, it seems many of those demands aren't from Congress. Some are. We are not completely free from any responsibility, but many of those reports are required by the Department of Energy, layers of oversight, I think in the environmental management. There are, you said, 1,200 to 1,600 people doing nothing except making reports and fulfilling obligation responsibilities given by the Department of Energy. Some oversight is necessary.

We have learned through the years that we just can't give somebody a job out here and give them money without asking, what did you do with our money? How would they come back and report to us then?

Mr. GALVIN. You are absolutely addressing, sir, what is the Federal norm and we got a great country. We got a great Congress and we have all the good things about our government.

Mr. MYERS. Recently anyway, yes, I agree. We have got them outnumbered here today, too. We have been good friends. Pardon me. Go ahead.

Mr. GALVIN. Your concerns are the natural Federal norm concerns, but what our task force is hoping we can intrigue you, and maybe eventually convince you to recognize, is that the other parts of society, other than the Laboratories, and a few things where the Department is putting the—they are the manifest auditors of this over control, but they are taking their cue from you folks. That is why we first address you and then we address them.

They are engaged in, in our estimation, overkill because they want to make damn sure they satisfy you people. They respect you. They want to satisfy you.

I respectfully suggest that even though all kinds of institutions like Motorola occasionally have a glitch, we make some mistakes, that on balance, we get at all these oversight situations. OSHA can take a look at us. Let OSHA take a look at the Department of Labs, but not have the Department have its own separate regulatory approach. So remember, we say this nonprofit corporation will be subject to the same laws and regulations that all other, including profit corporations must live with. But that is it, and—but not a lot of auditing. Let them hire Arthur Andersen or Peat Marwick or Ernst & Ernst or whoever as the auditing company.

Mr. MYERS. Don't suggest it.

Mr. GALVIN. So you will have plenty of oversight of the natural process.

Mr. MYERS. That will be another expense they will be asking for this year. I serve on—not anymore, can't anymore legally serve on boards. My wife does, but I think of our role here as something like a board of directors of a corporation and the corporation is you, the taxpayers, and we have some responsibility, I think, and maybe we overexercise that at times, but I think we have some responsibility.

Mr. Bevill?

BEST MANAGEMENT SYSTEMS

Mr. BEVILL. Thank you, Mr. Chairman. I was wondering there in your study by the staffs' subcommittees and so forth, did you come up with any recommendations or do you have any feelings on it as to whether the most efficient method as far as the taxpayers getting their money's worth and accomplishing a mission, as to whether it is best to use a university like Princeton on fusion, or like Lockheed, you mentioned in the private industry, or just those that work directly under just the Department of Energy? Do you have any feelings as to which system or which method is the best?

Mr. GALVIN. Yes, sir. We address that subject very extensively in the text, which may be worthy of your having that part delineated for you by the staff. And the matter that we come down on the subject is that there, quote, "isn't a best way," but there is a very optimizable systems way of balancing all of them in their proper roles.

Our task force was—went out of its way to be respectful for the university research role in our society because we believed in it. And we think that the Laboratories should not try to take anything away from the universities. The universities do some things better than the Labs can do them and we delineate why and how.

It is a very natural, wonderful quality that they have. There are many things that only the Laboratories can do because they are the central repository of the big equipments and they have the pool of all the scientists in one place, which many universities can't pull altogether. The Princeton Lab on fusion, for example, it is as good as the best and that kind of thing should continue to be supported.

So I think you will see that we are in effect saying almost from the first page, let's have a balanced science. Let's have a balanced resourcing of the right science producers, whether they be the universities or the Laboratories, and incidentally, the private sector contributes something also, though ours is more of the engineering and the applied sciences area.

So, yes, sir, we—I think that you will find that our recommendations are balanced, but there is not a selection of just one versus the other.

Mr. BEVILL. Thank you, Mr. Chairman.

Mr. MYERS. Thank you, Tom. Mr. Rogers.

BASIC LONG-TERM RESEARCH

Mr. ROGERS. Our country and the Congress, reflecting that, has had difficulty focusing on long-term pure science research. We seem to only react to the immediate need that we see, therefore we did Oak Ridge, we did a launch to the moon and all of that, but there was a practical, political goal that the country coalesced around in all of those events.

But when it comes to research for the sake of research alone, the pure science, we grope with that and then we back away from it. The Superconducting Super Collider is an example, I suspect. Trying to get the country behind and the political money behind that type of research, where there is no practical end goal that is being striven for, and yet that is what you are proposing here, I think, is it not, that we institutionalize these Labs into a—more or less a pure science effort?

I think you are groping for trying to find that goal out there, that practical application of pure research, that would allow us to sell it therefore to the country. Can you help us out a little bit more with that? How can we sell a Congress now that is bent on balancing the budget and cutting some very basic, practical things that we need to be doing for our people. How can we say to them, we are going to take some of the food stamp monies or feeding for infant children and put it into pure science and research because blank. Help me out.

Mr. GALVIN. I will try, sir. Let me—I hope I will not editorialize too much. Mr. Chairman, cut me off if I do.

Mr. MYERS. Keep on going. We enjoy it.

Mr. GALVIN. When you get to be my age, sir, people ask the question, what have you seen and what do you foresee, and I normally give four sentences. I will only give half the message. I have seen 16 bits of surprises. I foresee 32 bits of surprises. A surprise is a surprise.

When I entered our company at the age of 17, nobody that was anywhere around us had any idea there was a thing called a semiconductor effect, semiconductor industry transistors integrated circuits. You see those. That was a scientific surprise discovered by the Bell Telephone Laboratories which, incidentally, has been a contractor for some of the other Laboratories.

The development of the semiconductor scientific effect has created hundreds of thousands—millions of jobs. We are going to have many more surprises if you will allow or encourage and the rest of us will all help support scientific investigation.

Yesterday, I had lunch at my office with Jim Cronin. Jim Cronin is a noble scientist. He was there for an entirely different reason than what we are talking about. Jim Cronin is now working on trying to discover what is a cosmic ray. No practical application at all, but as we were moving to lunch, I walked to my window and I pointed out my window.

We have a big campus and lot of factories and offices on this one campus, and I said, Jim, you don't know what you are going to learn about exploring cosmic rays in Fermi Lab. See, all those cars in that parking lot? You know why they are there? It is because Hertz and Faraday discovered principles 100 years ago and DeForest figured out a way of putting the grid in a diode radio tube to control electrons to make the electronics industry, and because Marconi invented or discovered there was energy that was transmittable through the—you can see what I am talking about.

All those people out there, of which we now have 125,000 around the world, are all working because those people discovered scientific principles.

Now, you say, yes, but Bob, that is too long ago. I can't deal with 100 years. I think you got to deal with the fact that these things mature into economic development, human benefits, as a function of time. We don't have instant science. We don't have instant success. Now you know that history—forgive me for boring you with my pieces.

Mr. ROGERS. You are not boring us at all.

Mr. GALVIN. But that is what is bending companies like Motorola. When we discerned that there was a way of geographically sharing the spectrum in a way that could create a system called cellular telephone in the late 1950s and 1960s, it took us 25 years to make that into a job-producing event, but there was some very basic engineering that went into that kind of thing.

So it is these surprises in science from which we can then exploit honorably, exploit utility value that finally produces a system or a product or a solution to a health care thing or what have you.

Incidentally, sir, the—and the sensitivity to the human equation and the compassion for people, God, I know that has got to be central to your responsibilities as public servants and I think the rest of us have an orientation to that as well. But what you are supporting in science in these regards is really rather de minimis.

For example, the National Science Foundation budget for universities is something in the order of $2.5 billion. Well, those are pretty big numbers to you and me as individuals, but considering our total Gross National Product, budget, et cetera, for what we will eventually get by the next Hertz, the next Faraday, the next Marconi idea, from the universities is—the multiple will be orders of magnitude, an order of magnitude is 10 times, and 10 times more is 100 and 10 times more is a thousand. So for—I would plead for you, at least support the universities. Forget the Labs for a minute. You got to do that. But he wanted to know how balanced this should be. You are only talking about five, $6 billion for these Laboratories.

Now, stop spending money for the nonvalue-added part of the thing and your conscience will be even more excited about this situation.

If you have got—I don't know how many people in the Department of Energy are overseeing this. They aren't contributing any science. Five, six, 7,000 people. Every thousand people represents $50 million. You know, why don't you cut out 5,000 people in the department? I am sure the Secretary won't like me saying that.

Mr. ROGERS. I so move, Mr. Chairman.

Mr. GALVIN. There is a quarter of a million dollars right there. But none of those things had economic value, except for the wonderful jobs those people—all of them are working like little beavers and doing their job right, but the science base gives us a surprise from which the rest of us can create economic benefit.

Mr. ROGERS. Well, most of the discoveries or inventions that you have mentioned were done not by a government employee in a lab, government lab, but in a private enterprise lab on the way toward some other mission.

I suppose we could say that the NASA moon mission produced a ton of side effects with which we now live, and the production of the nuclear weapons did the same thing, but I guess what I am saying is that unless there is some overarching national goal that we are after, such as a nuclear weapon or a launch to the moon or what have you, and—that it is difficult for us to muster the political support for this kind of money unless there is that national goal out there and then we discover all of these other things on the way to that goal.

I guess what I am trying to do is to say that you have got to come up with a national goal for these Labs that is overarching, that is of national importance other than basic scientific research, because it is too boring for us to sell to the public.

Mr. GALVIN. I respectfully suggest, sir, it is all in our report. Let me tick them off. You cannot avoid the responsibility of seeing us through the next 40 to 50 years of managing the nuclear stockpile and all of its product cleanup, international relations phenomenons. Whether we like it or not, that science-based problem is yours. You can't escape it.

I don't know what percentage it is of the Labs exactly. It is at least 25 percent, so there is one that you might just as well say, by golly, we got to have a positive attitude. We got to do that the most effective way and you are going to have to have very fundamental science. We don't have the answers to remediate at this time. That is clear in our report.

The Department is going to say, oh, you are overexaggerating on that. Well, at least it is our opinion, you can't clean up what we got done right now. You can't solve the plume number problem. You won't solve all the international nuclear issues without better science, so there is one that I think is a slam dunk.

The second thing is energy. Maybe we got to have more dialogue on that to where it becomes captivating, but, sir, the day that you expect that, my God, I guess there is not enough oil or we better not use coal, what are we going to do to keep our furnaces going and our factories going and our vehicles moving, et cetera, et cetera. You have got yourself a very major national issue on your hands, and you face crisis in this Congress two or three times anecdotally, but the fundamental is there.

Third, there is a genuine ecology issue, a strenuous ecology issue for the world, industrial ecology, general social ecology, et cetera. Put it in remediation terms, clean-up terms if you want, but you have got to anticipate not creating more ecological problems. That is a giant responsibility so that this earth is inhabitable 25, 100 and 200 years from now.

Now, that doesn't sound as exciting as aid for dependent children right now, if I hold this child in my hand, but, sir, that is going to have transcending impact on people. Those are the three fundamental classes of activities for which you need the science and engineering to support those things and then you incidentally get these marvelous benefits of an industry for energy and derivative factors.

That is all it is. That is why we say, don't look for something else that you are sciencing. Just look at solving the defense and solving the energy and solve the remediation situation, which are so vast that you will get so damn much science out of that, I think it is there. I am sorry I am not a marketing presenter of it. I think I am a pretty sincere advocate of the fundamental.

Maybe we got to find some picturesque speech to make it more politically appealable to you. But we have separately said this sloganizing itself has been self-defeating. The Department has always been looking for four words to give everybody the answer and as soon as you do that, all the Labs go off and say, see, look, we are doing what the four words have.

Focus is one of the things. There are compelling factors, sir. I would hope that at some point we could convince enough of you that these are way more important than going to the moon. We just have to picture it for you better apparently.

Mr. ROGERS. I was just going to say in closing that I don't know of a better salesman for the point of view that I have ever heard than the gentleman is. You have done a masterful job here today as far as I am concerned and your report as well, which I have not had a chance to study in any detail yet, but you are very, very articulate and I can see why you were successful in your private life.

Mr. GALVIN. Thank you.

Mr. ROGERS. Thank you.

Mr. MYERS. Thank you, Hal. Mr. Knollenberg.

POLITICAL OVERSIGHT

Mr. KNOLLENBERG. Sorry I missed the interim and I do appreciate your testimony, Mr. Galvin. Some of this may have been talked about in my absence. You make some points that I think are outstanding and interesting and at the same time confusing in a way to me because I know that with politics being a part of this whole process, it is very, very difficult to run away from it. One of the things that has bothered you that I can tell is the micromanagement of the political system and the impact on politics and politicians and what they are apt to say to protect their own turf, their own backsides.

We have a system we are talking about now with training or rather—not training Governors. They already know how to do it, but exchanging the bureaucracy at the Federal level and placing it at the State level, and in your very direct and straightforward testimony, you mention that the system of governance is broken. It is not the individual units, and you cite the four.

I guess I would like—and maybe you have talked about this, but I would like to know how do you remove politics from oversight? How do you—what kind of direction can you give us to indicate that we might follow a track that would put us closer to what you are talking about?

Mr. GALVIN. Thank you. As a matter of fact, sir, we did discuss that subject, but you open the opportunity for me to say some things a little different, but I think also consistent and very precisely aimed at the way you phrased the question, can I posture something to where this—it would flow, that what we advocate would be worthy of doing.

Not so many minutes ago, the Chairman used a fascinating analogy and said, you know, we have talked about, what you say, Galvin, that you want a board of trustees. That is sort of what we are. He, in fact, gestured to the Federal Government and committees like yours. We are sort of like a board of trustees.

Let me give you a different image of what I think you ought to be. And we write it in this document, and that is that you ought to be the customer. Don't think—you. You are the customer, you, the Federal Government, are the customer.

Now, who are you? Are you the surrogate for us? We are the citizens. You happen to be sitting in these important chairs temporarily for the next five or 10 sessions that you are elected for the next five or 10 times, but the fact of the matter is, what you are in our estimation is the customer. Behave like a customer. You are not the board of trustees. You are the owners and the customer. So I have given you two roles now. You are the owners of the system, like the stockholders of a company, but you are also the customer.

You can play more than one role. But stop at those two roles. If you want to put in a subpart and call yourself the sponsors, the owner, customer, we are the sponsor of all these objectives that Mr. Rogers and I were just generalizing on a moment ago. Customers don't tell their suppliers how to do things. Oh, yes, there are some iterations and so on.

I want my molds to do this or I want my product to have these specifications, very practical iterations, but none of our customers tell us how to make semiconductors or how to pay our people or what benefits to have for our employees. That is our job as the private sector and that can be the duty and responsibility of a nonprofit corporation supplying you just as well as a profit-making corporation.

And we say so in this document, that the Department should be the sponsor of the Laboratories' objectives, certainly have general opportunities to fashion what would be the national sense of purpose, et cetera, be part of the road map constructions and so on, but that if it acts like a customer, as the best customers in the private sector are showing us how to do, don't tell us anything else about how to run our business. Let that be the function of the trustees who know more about that than I respectfully suggest most of you do and more than most of the people who are excellent government employees.

So let us run the business and you make sure in general on qualitative evaluations that you must now learn how to do as a good customer versus all these pragmatic I will check your system and see whether or not you put the pay raise in on Thursday instead of Tuesday and all those kinds of things, which are obfuscating the system. So there, sir, is a potential imagine factor that you might be willing to say, you know what? We will experiment with that. We will try that for this little slice of the Federal system. We will act like a customer and we will become a world class customer.

World class customers do not tell their suppliers what to do, and their suppliers will do things way better, honorably integrity-wise, ethics-wise, performance-wise, than those that are dictated to by— and world class customers just don't dictate.

Mr. KNOLLENBERG. If we were to follow the suggestions that you make, and incidentally in your testimony you also talk about reading the Gettysburg Address. I know what a score is——

Mr. GALVIN. Say that again, sir.

Mr. KNOLLENBERG. I say, being familiar with the Gettysburg Address and Abraham Lincoln's key words I am familiar with a score. You mentioned here that there should be some kind of vision created for two score years, which apparently is 40 in my judgment.

Mr. GALVIN. That is right.

Mr. KNOLLENBERG. Still 40. That is quite a length of time. So if we were to, let's say, become the customer and become the stockholder simultaneously, I am talking about Congress, I think that is what I heard you say. We have to craft a pretty specific vision for the next 40 years.

Now, I don't know if you are applying these recommendations with that scope of years in mind. I assume you are, but whatever we do, we are going to have to do very carefully. And in one area, for example, you mention, and this goes to the matter of—well, one little thing you did say, that, for example, Lawrence Livermore's national security missions can be reduced.

I suspect that then the cost can be reduced along with that. You also say that the existing budget of the national—or I should say you—I understand it is you. I understood and perhaps some others, but the existing budget of the National Laboratory system exceeds that required to perform its agenda in the areas of national security, energy, environmental and fundamental service.

Well, and you also go on to say it is unrealistic for these institutions to attempt to retain their current size by laying claim to new missions. Well, how much could we save? Is that something that you could impart a little information on? What would we be looking for here?

REDUCING COSTS

Mr. GALVIN. Yes, sir. May I first attempt to clarify the fact that we got so damn many things and the thing is that they keep mixing and matching and sometimes it is hard to interpret what we meant. The 40-year reference, the two score reference specifically refers to the fact that we think you are axiomatically obliged to recognize you cannot get out of the responsibility of the stockpile stewardship of the weapons issues.

We got so much plutonium to gather back from the rest of the world and we have got so many weapons to decommission, et cetera, all of which take immense science. There is a lot of science that has got to go along with it. That is the 40-year period.

So we are not asking for you to try to have a clairvoyance on everything else for 40 years. We are simply pointing out, you have got no alternative as a Congress, but to see to it that we unravel what we had to do to build the atomic bomb. Good, bad or indifferent, there it is. You have got to live through this problem. That is the 40 years.

There is another reference of time in our document and it says over a five-year period of time, if you move towards this new governance, you can start to reduce the budget of the Laboratories, and, of course, reduce all this micromanagement cost also and wallow in the dividends that are going to be if, indeed, you elect to take that tact.

So we are saying that if you use road maps, if you start thinking in terms of increments like five years, if you do some multiyear funding, I don't know whether that is two years or three years, again, rewriting the rules of how you do some business to experiment with this very important responsibility, the visioning will not be all that complex.

You as the sponsor and the customer and the Department as a sponsor and customer, you will find that the ability to generally envision what ought to happen is going to come very clear. It ain't clear now because they haven't tried to do that, but some of us who have had experience know they can clarify it and you will be able to see five or six or eight years ahead pretty clearly with regard to all these kinds of things.

You got to just say, I know I got to stay the course on national security issues for 40 years. It is going to take that long to clean it. That is the separation of those two things, sir. I am sorry. You also put some other very important things in there, but my mind is too fragile to have remembered them. Just tell me what you refer to. You don't have to repeat the statement. You read a couple things out of our document.

Mr. KNOLLENBERG. Regarding savings that might be realized.

Mr. GALVIN. Savings, okay. In the case of Livermore, if, as we recommend, they should phase down, phase away from nuclear weapon design, that is what we say they could be phased down from. They should stay close to matters having to do with proliferation, counterproliferation, verification, intelligence, et cetera. They have some tremendous science-based factors that influence all those kinds of things. So, yes, they could be downsized, and incidentally, everything should be downsized in our government, so the Labs shouldn't be immune from that. We are not trying to keep them up to some level.

What we are saying when we say don't go out in a more physical or uncontrolled way and just look for any and all other missions just to keep your people working, but we really mean that. But there is within the mission, the prime missions of the Laboratories so many more things to be done that the road map may or may not convince you that we ought to put something more into some fundamental sciences that look like, you know what, that might produce some good in 10 years. I am using made up words here now, but I think they are sort of in the realm of reality.

So as a person who has dealt in microcosms of this kind of thing now for better than 40 years in the leadership of our company, I can see this unfolding magnificently in terms of something that eventually you would say, now I see what they hoped would come to pass. It makes it clearer for me as the sponsor and as the customer to be ready to support, which only can be done by these big complex Labs with centralized people.

A very important point was made by one of you gentleman about the fact that a lot of science came from individuals in the past and it is still going to come from individuals to a, hopefully, large degree. But some elements of our unpeeling the essence of nature can only now be done with immensely sophisticated tools.

This is off the radar screen, but my visit with my friend, Cronin, yesterday, noble scientist, now I am going to try to understand the essence of cosmic rays. Nobody understands what a cosmic ray is. He is going to have to instrument thousands of square kilometers of flat spaces on the earth in order to capture an occasional cosmic ray and finally reason back from what he discovers what the hell they are. Ain't going to create any jobs for the next 20 years, but he has got a little project at Fermi Lab. I just learned that. But you have to have some things that are very big. You have to have big accelerators to get little neutrons and you need neutrons to feed the scientific system of discerning what the essence of some material is.

If you don't know the essence of the material, maybe you can't solder as well, maybe you can't mold as well. Maybe you can't produce as inexpensively. It is a tremendously vast and exciting intellectual system that all feeds back to finally putting cars in parking lots.

COST SAVINGS

Mr. KNOLLENBERG. But you can see some savings resulting from the course of the action that you describe.

Mr. GALVIN. Oh, sir, written in this document you will see kind of a recitation of some experiences. When we went to the Labs, now, we went to the Labs and in effect said, "Hey, folks, help us write our report." We would like to hear from the people—we said that to the Department.

In the course of a few of those meetings, I would interject and say, I would like to ask all of you assembled experts here, if we freed you from all this micromanagement, how much do you think you would save?

Well, the leader would always speak up first, as he should, and he would be most respectful. They were always respectful of their department and their country, et cetera, and I remember one of the great leaders there said, well, at least 10 percent of our budget could be saved if we weren't obfuscated with this micromanagement.

Well, you could feel the dynamics around the room, great staff that that person had and, bingo, somebody said the hell it is. We will save 40 percent, 30 percent. It was like an auction, and our members—about half our members were at some of those meetings. Our company has some credentials with regard to the issue of quality systems and the effect on productivity. We won—we are the first winners of the Baldrige award so we know a little bit about this.

As soon as you allow the get-out-of-the-way quality systems, you will automatically save a minimum of 20 percent of the budget of your operation because your quality systems start to eliminate unnecessary functions and you put your efforts productively around the most effective.

Twenty is the minimum. Forty is very likely. So I even say in my testimony, you might get twice the value eventually if you really just go back and act like a sponsor and a customer and let these people, these real pros out there show you how things could be done for the Federal benefit, but not according to the old Federal norm.

Mr. KNOLLENBERG. Well, I appreciate that. That is the kind of an idea that I would like to see brought to fruition, so your wisdom here today is certainly appreciated. We would like to see some of that achieved that you are talking about.

Mr. GALVIN. You have got to have the guts to say, let's try it.

Mr. KNOLLENBERG. That is our job. That is our job.

Mr. GALVIN. Yes. That is your real job. You got to have guts.

Mr. KNOLLENBERG. I have overstretched my time here, Mr. Chairman, but I do appreciate, again, very much, though, Mr. Galvin, your commentary. Thank you.

Mr. MYERS. Well, thank you, Joe. Since you missed the first two rounds, I thought you would catch up now.

Mr. Riggs.

STRATEGIC FOCUS

Mr. RIGGS. Thank you, Mr. Chairman, and Mr. Galvin, good morning. It is a pleasure to meet someone of your background and your stature. And I would just, from listening to your concluding remarks to my colleagues, suggest perhaps we could benefit from your expertise in some other areas of the—of our work back here with respect to trying to improve and streamline various Federal Government programs which, as you well know, are quite fragmented and in many cases quite duplicative of services that are already delivered perhaps better at the State and local level.

But let me turn to the subject of the hearing today, and I am wondering at the outset of my questioning, if you could explain what appears to be a basic contradiction between Secretary O'Leary's response to your report wherein she says the task force makes a persuasive case that the Laboratories, working with the Department, should sharpen their strategic focus on areas of established excellence and not venture off in search of major new missions, and, of course, one of the recommendations of the task force is—in fact, I quote from the summary of recommendations.

We must be in quest of that. We do not know in every field of science, so there would appear to be a basic contradiction between that task force recommendation and the Secretary's response to the task force's recommendations. Could you address that for me?

[The Secretary of Energy's response to the Task Force report follows:]

The Secretary of Energy
Washington, DC 20585

Response by Secretary Hazel R. O'Leary to the Final Report of the Task Force on Alternative Futures for the Department of Energy National Laboratories

February 1, 1995

With the benefit of the past day to fully review the Task Force report, these are my initial observations. We will develop a more detailed response during the period of public comment, which ends February 15. Our full analysis and implementation plan will be submitted to the National Science and Technology Council by March 7, 1995, for inclusion in a report to the President that will address the laboratories of the Department of Energy, Department of Defense and NASA. That report is due April 15, 1995.

When I initiated this study one year ago, I commissioned a fiercely independent group to provide tough scrutiny of the DOE laboratories. Under the leadership of Bob Galvin, and the Task Force members who have given fully of their time, the Nation now has an ambitious set of proposals regarding the future of these institutions. I wanted recommendations that challenged the Department and its laboratories to reach new levels of performance in meeting national needs. To a large extent, the Task Force has met these expectations.

It is clear to me that the Department will be able to embrace and aggressively act on the overwhelming majority of the Task Force's recommendations. These recommendations will provide the means for a more efficient and cost-effective DOE laboratory system than ever before. Much will be required of the Department and its labs in responding to this report.

The Task Force has clearly and forcefully validated the importance of the major R&D missions of the Department and its laboratories. Words like 'vital,' 'urgent,' 'critical,' and 'important' are used throughout the report in describing the research agendas of the DOE laboratories in the areas of energy, environment, national security, and fundamental science.

We welcome the Task Force's bullish stance on the Department's fundamental science mission and share the Task Force's view that "the laboratories' research role is part of an essential, fundamental cornerstone for continuing leadership by the United States." We also share the view that energy and environmental R&D at the labs must be more closely integrated.

We are pleased by the Task Force's support for the Department's science-based stockpile stewardship program, including support for construction of the National Ignition Facility. The Department will closely evaluate the recommendations regarding a reduction of some of the nuclear weapons functions at Lawrence Livermore and their transfer to Los Alamos. I have an initial favorable disposition for a careful phase-down of some of Livermore's nuclear weapons work, combined with a re-emphasis on non-proliferation, counter-proliferation, and verification activities.

The Task Force makes a persuasive case that the laboratories, working with the Department, should sharpen their strategic focus on areas of established excellence, and not venture off in search of major new missions. The general message is that federal institutions must borrow a page from the private sector, where companies are achieving major performance improvements by consolidating around their essential strengths. We have already begun the necessary process through our strategic planning and Strategic Alignment initiatives, which will gain momentum with the five-year, $10.6 billion DOE budget reduction announced in December. Through these efforts, we will sharpen the focus of the laboratories on their distinctive and world-class capabilities and help guide the Department's decisions regarding laboratory downsizing and the elimination of lower quality functions.

The Task Force includes a critical assessment of the Department's Environmental Management program. This program lies largely outside the scope of the laboratories. As such, I do not believe that sufficient effort was made by the Task Force to develop a full understanding of the strides we have made in directly addressing problems we inherited from the past. Over the past two years, we have worked to assess and to quantify the vulnerabilities at each site and have established both a national advisory board--which includes world-class scientists--and a host of site-specific advisory boards. We have taken--and are continuing to take--bold actions to cut costs, reinvent the program, and accelerate clean-up activities. We already have successfully implemented several of the Task Force's recommendations in this area. We agree that the science and technology base must be greatly expanded for this program. In our view, cost and performance of the labs vis-a-vis industry and academia must drive decisions regarding their relative roles in the development of clean-up technologies.

The Task Force concludes that Industrial Competitiveness is not an appropriate primary mission of the laboratories. We agree. It has always been our intention that collaborations with industry be viewed as a derivative and critical success indicator of our other missions. Through its partnerships with industry, the Department helps to maximize the value of the public investment in these institutions by increasing the prospects of getting taxpayer-financed innovations to the marketplace, while also meeting DOE mission requirements. The Task Force's concludes that industrial collaborations at the labs should be tied to core DOE mission areas, and they acknowledge that we already are implementing this approach.

The Department concurs that the existing system of management of the laboratories is costly, bureaucratic, and inefficient--due to a 40-year legacy of creeping micromanagement and uncoordinated and excessive oversight of the labs by Congress, the Department, and multiple review bodies. DOE orders are excessive, redundant and vague. This report provides new urgency to our efforts, already well underway, to reduce and eliminate DOE orders and to strip away non-value-added layers. We are eager to work with the labs, Congress, the General Accounting Office, and others on ways to achieve dramatic improvements in the cost-performance of these institutions, while also meeting environmental, safety, health, and fiscal accountability requirements established by statute.

Responding to my request for alternate management schemes, the Task Force recommends a new and innovative governance structure for the laboratories. The proposal would be an unprecedented approach, and thus we will need to learn much more about its potential benefits and liabilities. We will ask the full Secretary of Energy Advisory Board to assist in further assessing this proposal and its implications.

The bottom line: I welcome the Task Force's report and am heartened by their strong validation of the R&D functions of the Department and its National laboratories.

BASIC RESEARCH

Mr. GALVIN. Yes, sir. I think that is a very valid criticism of our rhetoric and what we have here is a—I think, a rather good document that was the integration of many of us writing our subcommittee reports and attempting, incidentally, to have them orchestrate well with each other.

I suggest that if you go to the exact paragraphs where the reference is made that we want to—we must have the ability to learn everything from science. It is in context of a preceding statement and I am sorry I am not an encyclopedia to remember exactly what that was, but it had to do with the fact that if we will encourage a liberal but practical amount of research aimed at the mission sciences, the energy, the national security, the remediation, that we should hope that every derivative piece of science that comes out of that much focus will give us knowledge about things that otherwise we may not have expected to learn. Those might be some of the surprises.

I don't know if you heard me iterate on the issues of surprises a few minutes ago with Mr. Rogers. But it does sound like we are contradictory and I think that is my fault. I didn't sharpen some of those interrelated factors.

I think—I don't know what the Secretary's point of view is about the need for focus within the areas of elected missions or assigned missions, but I think it is fair for me to report that those of us who went out and walked the Laboratory floors and talked to the people, that we heard them say they haven't got enough focus, but we clearly interpreted they didn't have enough focus and that they were really looking out on—into the hinterlands.

Now, one of the interesting dichotomies that we have had, sir, is that we had to start with some degree of initial impression as to what was going on the day we took our job, or the early period, and maybe you will recall that a year ago and two years ago, there was an awful lot of rhetoric about, boy, industrial competitiveness, technology transfer, we got to create jobs, was permeating the atmosphere of this issue.

If you look at some of the literature of the Laboratories or the Department, there is a rather liberal amount of, boy, we got to help the industrial competitiveness. We have got to get industry back on the track, et cetera. There were places and times where we said, boy, we hope you guys, when you finish your report, will come up with a matrix that shows how many jobs can be created by what we spend on the Labs. That is kind of what you were getting at, Mr. Rogers, and it didn't take us long to at least come down to a determination of our biases, and maybe that is what they are, that that kind of—kind of loose exploring for something else to do was confusing the issue and that really wasn't what the Laboratories should be doing and therefore, let's get back to at least the general focus of defense, energy, remediation as the central core missions. And there will be plenty of derivatives that will come out of that. I don't know that we explained that well enough and I don't know whether I have confused it more by what I have just said.

BOARD OF TRUSTEES

Mr. RIGGS. But it is your belief, sir, we need a national board of directors to make sure that the Labs adhere to that focus?

Mr. GALVIN. Yes. I think we need a—we think you should continue corporatization, which would be hierarchied by a board of trustees to see to all these aggregations of things being done very effectively and efficiently. Better than we think they could be done if you continued the GOCO system.

NATIONAL IGNITION FACILITY

Mr. RIGGS. Let me follow up my first question and give you a specific, for instance, that has caused some consternation with some of my colleagues within the California Congressional Delegation and that is Lawrence Livermore, and, specifically, the issue of fusion research at the National Ignition Facility.

Where does that fit in when the Secretary says sharpen strategic focus on the areas of established excellence, yet the task force recommends wide exploration across the spectrum of science? And how do you address the concerns, if I might just follow that up, that fusion research appears to be somewhat open-ended and could obviously be extremely costly.

Mr. GALVIN. Let me see if I can serve up and then we can find that there is some integration to the few things that I will say about these subjects. Let me start with the proposition that on—very much on balance. We came down on the positive side that the administration or the Congress or the Secretary's decision to proceed with NIF was a sound idea and the doing of it at Lawrence Livermore appeared to be as wise a choice as we were capable as part-time evaluators could make it a subject and some of our evaluators are pretty sophisticated people. So we were pretty positive about the fact that that should exist.

If that tool were only usable for national defense, I suppose we—and this is speculation—I suppose we would have wondered about either having a NIF or having it at Livermore, but because we evaluated that, it is a generic research tool as well as a helpful tool for national security, that it is good for it to exist and Livermore is a good place for it to exist.

We think Livermore should continue to be a very important Laboratory in the system, but it just changes its totality of activity because you people have to start narrowing things a lot, some, and one of the things is that because we are not faced with an inordinate threat with regard to nuclear weapons, we ought to be able to get back from three Labs designing weapons and/or causing them to be reprocessed to eventually two doing that, but there are so many damn other related things having to do with proliferation, counterproliferation, intelligence, et cetera, and this science base has to be occurred, that in this complex issue of governing these Labs, this isn't something where you can just sort of add up two and two and say this is this and that is that and that takes care of it.

People have to spend weeks figuring out the details, but in general we think that there is no inconsistency in wanting that tool as a major tool for American science and Livermore is one good place for it.

ACADEMIC GRANTS

Mr. RIGGS. Okay, I got a couple other questions I would like to quickly ask. You, in the—this sort of distillation of the task force recommendations, you say to the contractors, that is to say, academic institutions, you universities and/or private entities do yeoman work. You may serve in various capacities in the future.

Specifically, on the issue of Energy Department grants to academic institutions, would we not be better served by concentrating those limited taxpayer resources on the research conducted at the Labs?

Mr. GALVIN. No.

Mr. RIGGS. Why not?

Mr. GALVIN. I remind you that at least a coequal source of research output product benefit comes from the university system, the research system, university, the peer review of initiators, investigators, who are engaged in the multiple responsibility of doing research, training young researchers and young potential teachers and transferring technology from the very prolific base of that system.

I don't know how efficient and effective you know that system is in terms of how we all gather knowledge as a function of this system. It is subtle, but it is very practical. We would urge that you be of the mind that the university research base in our country that is very—it is the best in the world. It is the only place that is really good in the world.

It slightly exists in England, slightly exists in Germany, doesn't exist hardly at all in Japan. This is one of the great assets of our country. So not talking against the Laboratories, we say keep them both at a high energy level. So the universities are actually there. But you used the context there of saying that for contractors, which are either universities or are private sectors, there we are talking merely about their being managers, not researchers.

Later in the document we spend paragraphs talking about how universities should do research. What we said in the contractor paragraph, which is only two or three lines long in my summary, is that if you go to this private sector styled corporatized governance system, then let the company that is overseen by this board of trustees, let them hire contractors if they want to.

Notice we have turned the system upside down. I think it has turned it the right way. Incidentally, instead of a GOCO saying, let you contractors now manage the Labs. Let the Labs hire a contractor if they want them to do some service for them, and that happens in the private sector all the time. We hire contractors to do a lot of things. So maybe you would hire the University of California to do some work for Livermore or for Berkeley or you could hire Lockheed to do some work for Idaho. I forgot who the contractor was.

RIGHTS TO TECHNOLOGY DEVELOPMENT

Mr. RIGGS. Okay, and my last question is a fairly basic one, and that is the issue of government paying for technology development, but not necessarily sharing in the benefits.

Do you see the need for any changes, that is to say, do you see the need for a policy directive from us, from the Congress, to DOE that would ensure that government would be able to retain rights to proprietary developments that it has funded? And related to that, sir, also, if you would just very quickly address your recommendation regarding greater cost-sharing by the industrial sector as well.

Mr. GALVIN. Thank you. My guess is that we either didn't or inadequately addressed the issue of government rights. There ought to be a prolific, positive principle that in the application of any intellectual property that derives from the Laboratories or Laboratories working with DOE developers, that the government should have a right of use, a right to have made class of principle. I think that—I guess we kind of thought that was a given and we didn't address that properly.

I am not an expert on intellectual property detailed rights, but I think in general that would be the position of the task force. We talked around that and felt that that was a proper principle.

So incidentally you do have a very interesting potential conflict with regard to the most recently designed performance-based contracts that are now just being established, because there is a provision, and I am very loose on my language. I am sorry that I am not precise, that the contractor, the Battell, the Midwest Institute or the Department—or the University of California, there are many people who are contractors, that they have the right to acquire the intellectual property at the Laboratory and that is one of the incentives for somebody to be a contractor.

Gee, maybe I can exploit this development and I will make some more money. That will be honorable, but at any rate, it is a special option.

That is going to confuse some of us who would want to cooperate with that Laboratory if that contractor, who is also a competitor of ours somewhere else, he is going to get some rights that we wouldn't get. That is a detail, but it is a—this whole issue is just a very good opportunity mine field of lots of details like that.

So the intellectual property thing has to be done in the interest of the public and that ought to be a principle in this governance situation. What was the last part of your question?

COST-SHARING ARRANGEMENTS

Mr. RIGGS. The other one was somewhat related, concerned about cost-sharing, greater cost-sharing, I would say, by the industrial sector.

Mr. GALVIN. Our task force was of the mind or had the bias that we felt that the American people, taxpayers' money in this, that there should not be a privilege that unduly goes to an institution who reaches out to get some help from the Laboratory that they hadn't paid some reasonable price for.

Now, frankly we have people on our task force who said, hey, they have already paid for it when they paid their taxes, so you can debate this issue. But more of us thought.

Mr. RIGGS. That would mean it would be an entitlement of sorts.

Mr. GALVIN. What we didn't want is for this to become an entitlement. Now, how the details are worked out, I don't think I am even capable of delineating that at this time. We would like a fair deal.

In other words, if our company goes in and gets some honorably related help on a CRADA, for example, we think we should put up a heck of a lot of what went into that. The real benefit we get is smarter people that could help us solve the problem. There are some companies that say, no, I paid for that with my taxes. I deserve to get the benefit. You have to decide that one.

Mr. RIGGS. Well, thank you very much, Mr. Galvin, for your service to our country, and Mr. Chairman, I just want to flag those issues as being of particular interest to me. One is the issue, of course, of proprietary rights to technological advances or new technology and the other one is, of course, the cost-sharing issue, because I think some reform is needed in that area. So thank you, Mr. Chairman.

CORPORATIZATION OF THE LABORATORIES

Mr. MYERS. Thank you, Frank. Proprietary rights is something we have discussed for a good many years. Eventually the same taxpayer pays for it either way. It may be cheaper to pay for it directly rather than going through us.

Well, Mr. Galvin, I think I will try to summarize here somewhat. You did not quite agree with me in my analogy that we are the board of directors. The reason I say this, is the stockholders are the American taxpayers, and under your vision here of corporatizing the Labs, the trustees, it would seem to me, would be officers of that institution doing a job. And I think we are the board and we have to respond back to the taxpayer how we spent their money, and we have a hard-working couple out there, both a wife and husband are working hard to put shoes on their children, something in their stomach, something about educating them.

They come back and say, Myers, why did you spend $2.5 billion on a hole in Texas? We turned the money over to the Department of Energy and said, you run with it. These are the reasons why I feel we are somewhat on the board. We have to respond to how we spent their investment. That is not a good analogy. I think it is a little different if you say you hire contractors. I presume you say, here, here is so much money, do a job for me. You tell them what you want, don't you, when you hire a contractor?

Mr. GALVIN. Tell them what the end result will be, yes, sir.

Mr. MYERS. We don't tell them how to do it. We tell them what we expect of them. I don't mean to debate you on this. I think what you are recommending here, there is a lot of validity to it. We must make some consideration, but maybe the organization—we may have a little bit of style of organizing and it isn't provincial or parochial with us. I don't think any of us particularly want to go hang on to the vestiges of what we have had over the years, what you call micromanagement, but I think we are looking in the right direction.

I did note that in an earlier colloquy. Again, I think with Mr. Rogers, you said during your time with the Labs, you found them looking for new missions. It is called survival, and if you privatize or corporatize them, won't they be looking for new missions, each one of them? Will that really change any?

Mr. GALVIN. No, I don't think they would, sir. I think you would find that a group of practical scientists and business people, and that is all we see on this board—independently, we don't see you on that—I would like to join you and say, you be the senior board and then let's have this other as a less than senior board, but it would be sort of the operating.

Mr. MYERS. We shouldn't reverse it? I am not sure.

Mr. GALVIN. You clearly have the hierarchial position and those risks I am sure we could reconcile.

No, I think that you would find that private sector people have remarkable abilities to apply discipline and still have vision and still allow for explorations on the periphery of the science and so on. I do think that the system of exploring ideas back in 1993 at least, we start at the beginning of 1994, was really kind of loosely looking for anything and everything we could do in the Laboratories. That is what we sensed, and I think since we have come together, the Labs even say, hey, we are beginning to think more focused. We are beginning to think more as a system.

Incidentally, that is one of the benefits of these studies. Some benefits come out of studies even without a report because it makes people think sharper about what they are doing. So the Labs are getting better and even the Department is getting somewhat better in terms of its knowledge about these things, just because the report went on, not because we did it. They did their own thinking.

FUTURE ROLE OF DOE

Mr. MYERS. Earlier this month, we had a group in, kind of an overview of what the role of the Department should be, how it could maybe be reorganized. We had CATO and the Heritage Foundation as a couple of examples, four people that are all—four of them at least suggested we don't need the Labs. Private sector can do it.

Well, with the present tax structure, I think it would be very difficult with some of the advanced science that we ask the Labs to do for us, because of the present tax structure not being able to recover it through taxation. I don't know how the private sector can do some of the things we are asking the National Labs to do. Would you agree with this or am I wrong?

Mr. GALVIN. The task force would, I think, come down 180 degrees out of phase with such recommendations as you heard from that particular panel. All you have to do is spend a couple of days and walk around these Laboratories and look at their stewardship of tools, equipments, reactors and discover how important this is to both the Laboratory personnel and to people who contract the use of that personnel.

There is a new remarkable investigative tool that is just going on at Argonne Laboratories that has all manner of feeding mechanisms that customers like Dow Chemical or Princeton University can come in and have a section of that tool. Somebody has got to be the landlord for that kind of thing. Brookhaven has got all manner of master tools that people come from all over the country. They can't get their work done if they can't work with the intelligence base and the equipment base that is there.

Mr. MYERS. Those aren't micromanaged by us anyway and I don't think the Department of Energy either, are they?

Mr. GALVIN. The technology programs themselves are not micromanaged, but within the four walls of those institutions, the quantity of people that are obliged to deal with the administrative, micromanagement phenomenons is extraordinarily suffocating to the institution.

ENVIRONMENTAL MANAGEMENT

Mr. MYERS. Pardon me. One of the things you cited in your report was the mismanagement of the environmental management, and we have noticed that for years. As you have cited, we have put in $23 billion in the past five years for cleanup, both defense as well as the Department of Energy and other programs, and with very little success, and the 40 percent I believe you cited, 40 percent overhead of management, not really cleaning up.

Mr. GALVIN. In some Labs.

Mr. MYERS. This year I think the Department's request is for $7 billion. That is more than was spent on all these 10 Labs in research. I am not quite sure I understand the role you are suggesting these National Labs would play in the environmental cleanup and how much is necessary.

NEED FOR NEW CLEANUP TECHNOLOGIES

Mr. GALVIN. Well, there are many factors that are recited in our report. I will not pretend to remember them all. Let me cite what I think is at least the coequal of the most important.

It is our opinion that we do not have enough of the science formula, enough of the recipe for cleaning up the multiple messes that we have and that currently we are spending a lot of the $7 billion because somebody contracted, that they had to go through the motions. We are spending it inefficiently using the wrong recipes.

The Laboratories neither have, or because of their talents, could readily possess the ability to give new recipes eventually to cleaning up these messes, and the—that is the big role of the Laboratory. Correct the disconnects between what science could do and do it more efficiently and more economically versus what is trying to be done, somewhat organized and somewhat disorganized, under the $7 billion program, and incidentally, face the risk that you don't have to clean it up right away. That doesn't mean you are not—uninterested. But wait until you have got the right solution and then clean it up. There is a giant science job for the Laboratories.

Mr. MYERS. Then, if I understand what you are saying is you don't think it should be the mission of the Labs doing the cleanup, but merely improving the technology and the necessity, how much is important, where is the—what can we tolerate and what we cannot tolerate. Am I correct in your——

Mr. GALVIN. The way I say it, you are correct in interpreting what I say.

Mr. MYERS. I am saying it in cow pasture language, which I understand.

Mr. GALVIN. But the fact is there are a lot more paragraphs in the statement. No, one of the things that we are saying is, if certain Laboratories are commissioned to really spend more time on the science and they have some messes in their own geography, why don't you let them organize the solution as the role modelship of how you solve the problem on their property. So we see them having multiple roles.

First, give us the recipes, then maybe go cook the brew and clean up some of it and then it could be used by the Superfund peoples, et cetera, to solve similar problems wherever else they exist.

Mr. MYERS. Well, it is not a National Lab, but at Rocky Flats outside of Denver, we applied what you said here and it hasn't worked. They have messed around with it for five years, no farther along in the cleanup there of that facility than we were five years ago. So I don't disagree with you. I would hate to be combative here and argumentative.

I don't disagree with you, but when you give the role to some people, they just don't do the job. It takes some management, whether it is micro, whatever it is. It takes some direction. Some say this is the job; I want you to go do it. And you gave them five years, they haven't got the job done. You have got to do something different. I think that is what you are saying about the National Labs.

Mr. GALVIN. We have got several proposals about what we think ought to be different. I don't think the Department is quite as enthused about our recommendations there as they are about a few other things.

Mr. MYERS. I don't want to suggest there is a lack of enthusiasm on our part here. We might take a different road to get there, but down at the end of the road we certainly want to get to the destination. I am sorry again for the disruption we have had this morning, but it has really been minimal from what we sometimes experience.

We have a series of votes now. It is about five minutes and it is a three-minute walk over to the Floor, so on behalf of the committee, I do want to thank you for your contribution, both in the report that we all have read, and your being here this morning to explain in more detail the report, and may we ask you to respond to a few questions. We will try to keep it to a minimum.

Mr. GALVIN. Yes.

Mr. MYERS. And a little later on, if we come up with some ideas, could we call upon your expertise?

Mr. GALVIN. My role in life, sir, at this time is to do whatever little I can to increase the size of the pie of our society, and this is, to me, seminal as such a potential.

Mr. MYERS. I noted a moment ago you said that at your age now, people come to you and ask for advice or your experiences. By your analogy here, I saw a moment ago how old you are. You are three or four years older than I am. At what point do they start coming back? They are still telling me.

Mr. GALVIN. If you are close to my age, sir, you have special appearance genes.

Mr. MYERS. It helps. I think that is right. Well, thank you very much again for your contribution today and what you have done and the committee stands adjourned until 10 o'clock Tuesday morning.

[The written statement of Mr. Galvin and the report of the task force follow:]

WRITTEN TESTIMONY

OF

ROBERT W. GALVIN
CHAIRMAN OF THE EXECUTIVE COMMITTEE

MOTOROLA, INC.

BEFORE

THE HOUSE SUBCOMMITTEE
ON ENERGY AND WATER DEVELOPMENT

HOUSE COMMITTEE ON APPROPRIATIONS

February 24, 1995
Washington, D.C.

My name is Bob Galvin. I am the Chairman of the Task Force on Alternative Futures for the Department of Energy National Laboratories. We were requested by the Secretary of Energy's Advisory Board to prepare these proposals over a period of one year.

I am a businessman who has spent 55 years with one high technology company and have rubbed shoulders with scientists and engineers in that capacity and in a variety of pro bono jobs at the Federal level.

The 22 members of the Task Force were named by the Secretary. Their competence is exceptional. Most devoted extraordinary time. They brought related sophistication, firm forthrightness and convictions as well as collegiality in bringing synthesis to the subject. Though each of us retained certain biases we found no need for minority filings and have substantial agreement on the issues.

The Task Force respectfully suggests that the only way to fully understand the aggregation of its 80-100 proposals, depending on how you classify topics, is to study the entire text. We did not compose an executive summary because the broad and integrated factors cannot be usefully summarized in sound bites. However, as a guide we provide a special exact copy of the text. It has underlinings that allow a first scan to get the flow and the location of topics. We prepared this for announcement day introduction efficiency. It may assist you as may this document that lists the multiple suggestions in a shorthand litany keyed to pages.

* * *

The futures for the laboratories should and do derive from the past. They have been and are: a National Security role, an Energy role that includes Environmental factors and related Science and Engineering, an Environmental Cleanup role, a Science and Engineering role, an Economic role, though with deemphasis on general industrial competitiveness.

The primary National Security mission is to provide for a safe, secure and reliable nuclear stockpile in the absence of explosive testing for nuclear weapons and many other derivative and decommissioning factors.

The primary Energy Mission is to pursue a research and technology development agenda which enhances the long-term prospects for adequate energy supplies and efficient end use technology which minimize adverse environmental impacts.

The Environmental Cleanup role represents a monumental task in dealing with the radioactive and hazardous wastes at former nuclear weapons production sites and laboratories. This task cannot be addressed in an affordable fashion using today's technologies. The national laboratories have or can develop the technology which is urgently needed for the cleanup mission.

The national laboratories must serve a broad Scientific and Engineering Mission which underpins the Department's above cited mission areas and certain discrete areas such as high energy, nuclear and condensed matter physics.

The Economic Development role should be focused on those parts of the economy and industries that fall within the basic mission areas. Any other general benefit should be viewed as a derivative from the core missions. Development of technology for private sector companies in other areas should not be a prime mission.

We take some 50 pages in our report to expand and elucidate on the substance and subtleties of missions related above.

* * *

Four obvious audiences of this report are the Contractors, the Laboratories, the Department and the Congress. To help seed the discussion at this hearing let me distill some elements of this report addressing each of those audiences.

To the contractors, we simply say, "You universities and/or private sector entities do yeoman work. You may serve in various capacities in the future."

To the laboratories, we say, "You are important. You are capable. You must emphasize broad-based R&D long-term but you need better focus within your core missions. You must be allowed to renew at the periphery of your missions. You lab directors have to have a greater discretion on new R&D related to those missions. Your work should be balanced with university research and you should coordinate with industries that relate to your missions. But you should act more as a system, approach being a single, virtual laboratory. Establish lead labs. You should net your computers further. You should establish Centers of Excellence. You should be allowed to operate to Quality Systems like industry. You can improve functions. You can shave redundancies. Many dollars can be saved if you are allowed to operate to the efficient standards that we know you can ably manage. Your national security budget can be resized. Lawrence Livermore national security missions can be reduced. You should continue to do nondefense R&D. You need not report to the Department of Defense. Continue R&D on accelerator based production of Tritium. We'd like you to have a greater role in the environmental remediation science and solutions and be available to all. You will profit from using more technology roadmaps and you are capable of being worthy of greater trust in a new governance system."

To the Department, we say, "You have been pressed into a micromanagement mode. You must get out of the labs' way. The labs' Quality Systems must be allowed to flower. Major laboratory facilities and equipment, some of which we list in this report, deserve full support. There are many energy potentials and these must be prioritized. Stay a positive course on fission energy. Better integrate R&D and remediation and plan for further cooperation with others on this assignment. Establish an Industrial Ecology Board. Establish an Environmental Advisory Board. You'll have to renegotiate the environmental agreements with the communities and states and must find a way of convincing our publics to balance risks, the reality of the possible and of course your dedication to a sense of urgency regarding cleanup. Sustain and emphasize your dedication to long-term research and development. De-emphasize industrial competitiveness outside of prime mission areas. Redefine CRADA standards, the what and the who that are allowed as CRADA partners. Reduce cost recovery fees. Fund facilities separate from programs at least until the governance issue is settled. Radically streamline your management and upgrade the remainder personnel in their new roles."

To you the Congress, our message is direct. First we encourage you to embrace a major energy agenda for the country and reconfirm the support for the national defense objectives which will be obligations for a minimum of two score years. Hopefully you will support the laboratories and the Department on those duties and missions already recited but we particularly bring to your attention that the system of governance of the labs is broke. The laboratories did not break it. In the Task Force's judgment the responsibility rests first at the feet of Congress and second at the feet of the Department. Congress has mandated too much of the how to do, too much of the detail of what to do, too much accountability, it breeds micromanagement and has intimidated the Department to oppressibly impose excess accountabilities and micromanagements on the laboratories. The real waste in the system derives from the above. This as much as doubles the costs of what could be an efficient and an effective laboratory system. The primary organizational recommendation of the Task Force is to corporatize the labs. That is described in some detail in the report. The Congress should set broad objectives and let the laboratory professionals do the rest. The Congress must find a way of showing its endorsement of Quality Systems as the private sector has been learning to do. This involves "getting out of the way of the doers." We recommend that you allow a studied, clean-sheet of paper approach to a better system including general block-like funding over multiyears as a modest size, progressive experiment in how Federal functions might be better achieved in the 21st century. That will be a global century and we encourage inviting foreign funding in the labs and relaxing that policy that substantially limits the use of R&D results to only the United States. We make no recommendation closing labs or moving any to the Department of Defense. We believe you should support repair and modernizing of the facilities."

This governance proposal is acknowledged to be bold. It is our preferred solution versus the continuation of the GOCO system. But if the GOCO system is obliged, the second appendix in our report specifies the changes that can contribute to some renewal of the viability of the system. The evidence of the faults in the system are illustrated with a few of what could be thousands of anecdotes in the first appendix. We urge the Congress to take a fresh, bold look at enabling the laboratories to serve their important future responsibilities in a more effective and efficient way.

Thank you for this hearing.

MOTOROLA

ROBERT W. GALVIN

Chairman of the Executive Committee
Motorola, Inc.

Bob Galvin started his career at Motorola in 1940. He held the senior officership position in the company from 1959 until Jan. 11, 1990, when he became Chairman of the Executive Committee. He continues to serve as a full time officer of Motorola.

He attended the University of Notre Dame and the University of Chicago, and is currently a member and was the recent chairman of the Board of Trustees of Illinois Institute of Technology.

Galvin has been awarded honorary degrees and other recognitions, including election to the National Business Hall of Fame and the presentation of the National Medal of Technology in 1991.

Motorola is the first large company-wide winner of the Malcolm Baldrige National Quality Award presented by President Reagan at a White House ceremony in November, 1988.

10/91

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Summary of Recommendations from the Task Force

Overview

Page 1

1. The energy agenda requires, federal, senior cognizance.
2. Energy is central to the vitality of the country.

Page 2

3. Require...strong federal financial support.
4. A need for focus.
5. The laboratories must be free to renew and press the frontiers of their energy agenda.

because

Page 3

6. We must be in quest of that we do not know in every field of science.
7. The laboratories research role is essential for continuing leadership by the United States.

Page 4

8. These activities should be carefully managed, and should not be a license to move into areas of science and technology which are already being addressed...[elsewhere]
9. An appropriate division of labor among the Laboratories, industrial research institutions, and research universities can be established but does not sufficiently now exist.

Page 5

10. The existing budget exceeds that required.
11. It is unrealistic to claim "new missions."

Page 6

12. Energy R&D at the laboratories should be coordinated with the private sector.
13. Guided by technology roadmaps.

Page 7

14. Particular projects should be cost shared by the industrial sector.

Page 8

15. The current system of governance of these laboratories is broken and must be replaced with a bold alternative.

Page 9

16. A new paradigm of governance...must not be used as a political pretext to dismantle [the] laboratories.
17. The governance must ensure long term, fundamental research...not "job shops" for industry.
18. The new system must not be burdened by creeping micromanagement, non-productive oversight, and institutional fragmentation.
19. A balance must be achieved between continuing oversight and environmental damage...and excessive burdens and inherited environmental responsibilities.

Page 10

20. The Laboratory system is oversized
21. Could be downsized...through the elimination of functions and redundancies.
22. The Laboratories should work more as a system.
23. The Task Force does not make any recommendation about closure of laboratories.

The National Security Role

Page 12

24. The [national security mission] will require new types of management, personnel, and operation closer to industry's.
25. The weapons laboratories need the capability to respond both to implement START more quickly, or to return inactivated weapons to service.

Page 14

26. Rewards for high performers [should be provided].
27. Weed...out weaker performers.
28. Engender in the research and engineering staff a sense of achievement, based on personal responsibility and personal accountability [vis a vis new Governance].
29. Resize nuclear weapons laboratories over time to match DOD requirements.

30. The Task force believes LLNL should retain enough nuclear weapons design competence and technology base to continue its activities in non-proliferation, counter proliferation, intelligence support, and verification to provide independent review for several years while alternative approaches to peer review are developed.
31. LLNL [should] transfer direct stockpile support to other weapons laboratories as the requirements of science based stockpile stewardship, support of the DOD nuclear posture, and the status of test bans allow.

Page 15

32. These [weapons laboratories should] be managed in as open and collaborative a fashion as national security constraints will permit.
33. Continue funding the Dual-Axis Radiological Hydrodynamic Test (DARHT) facility.
34. Continue the Los Alamos Scattering Experiment/Los Alamos Meson Physics Facility (LANCE/LAMPF).
35. Continue advanced computing, including computing through workstation networks.
36. Proceed with the National Ignition Facility (NIF)...

Page 16

37. Non-nuclear defense research activities (should) continue at the weapons laboratories....
38. The capability-based deterrence should be based on Pantex, Los Alamos National Laboratories, and Sandia National Laboratories.
39. Continue R&D in accelerator-based production of tritium.

Page 17

40. The Task Force sees no compelling reason for DOD to manage the national security activities at the weapons laboratories.

[Pages 17 and 18 contain summary recommendations including recommendations previously stated in pages 12 through 16. They are not repeated here.]

The Energy, Environment, and Related Sciences and Engineering Role

Page 20

41. The Task Force believes the energy mission...deserves greater attention by the Laboratories, including working with the private sector.
42. The department needs a framework for rationalizing the management of energy supply and conservation technologies in terms of a strategic portfolio of research and development projects. (Better integration)
43. The highest priority research areas should be energy efficiency, conservation, renewable energy sources...and efficient recovery of gas and oil resources.
44. Continue to be involved in nuclear fission related R&D.

Page 21

45. A consensus must be developed among potentially competing technologies
46. Be careful to ensure that the energy R&D program is not captured or dominated by short-term interests.

Page 23

47. The laboratories should contribute to the integration of the development of the field of industrial ecology.
48. Establish an Industrial Ecology Advisory Board.

Page 24

49. Go further in developing mission assignments for the laboratories.

Page 25

50. Establish "virtual laboratories" via computer networks and lead laboratory assignments.

Page 26

51. Establish Centers of Excellence within the laboratory system.

The Environmental Clean Up Role

Page 34

52. Enhanced institutional connections will be required with other Federal bodies re the remediation program.

Page 35

53. Consider reducing the cost-recovery fees levied on all "Work for Others."

Page 36

54. Sustained improvements in DOE management and leadership are needed.
55. A comprehensive remedy to the EM program can only be achieved by a substantial commitment and high priority.
56. Establish an "Environmental Advisory Board (EAB).
57. The national laboratories together have a critical role to play, larger than at present, in performing high-quality science and engineering for the program.

Page 37

58. Make the national laboratories available to the entire government system as a powerful environmental technical resource.
59. Renegotiate the unrealistic or unfeasible elements of the cleanup compliance agreements that it has made with State and other entities.
60. More comprehensive involvement by members of the affected public in decision making should be engaged.
61. The bulk of the EM environment challenges, although presenting no immediate threats to public health or safety, still should be addressed with a heightened sense of urgency.

The Science Engineering Role

Page 42

62. Move to strengthen efforts in fundamental science and engineering, both at the laboratories and in universities.
63. Ensure a proper balance between the universities and laboratories.

Page 43

64. Support for operating and maintaining large facilities should be budgeted separately from programs.
65. Achieve better integration of basic research, technology development programs, and their applications, particularly in the area of environmental remediation.
66. Basic research at the laboratories should be more fully integrated into the national and international research community.

The Economic Role

Page 51

67. The government-funded technology transfer/industrial competitiveness activities should be focused on industries within the DOE's primary missions.
68. Laboratory directors should have flexibility to initiate or to approve new technical projects at the periphery of current laboratory activities.
69. Competitive selection and more rigorous technical and merit review by external experts should be applied to the Department's CRADA activities.

The Governance and Organization Issue

Page 54

70. We must begin to evolve the development and implementation of a new modus operandi of Federal support, based on a private sector style "corporatized" laboratory organization.

Page 55

71. The not-for-profit corporation(s) will be governed by a Board of Trustees of scientists and executives appointed by the President.

Page 56

72. This Board will select the officers.
73. Each lab would have a trustee advisory board elected by the parent board.

74. Initial funding will be in the form of Congressional line items in the DOE budget in each of the mission areas.
75. DOE will be the sponsor.
76. Fund for multiple years with a decline be built in over a five year period.
77. Allocation of these funds will be made by the corporation. The corporation will deal with traditional agencies for which work is done. Micromanaging or "earmarking" of these allocations should not be made by the Congress or the Department.
78. The corporation and laboratories will be subject to normal control of those agencies of the state and federal government that normally have authority over United States corporations.
79. Allocation to specific projects would be the responsibility of the DOE, with no earmarking from Congress beyond quantifying the amount of money given to each broad block.
80. DOE will be a customer, not "manager."

Page 58

81. Find ways of engaging cooperatively with foreign sources of funds.
82. Liberally use technology roadmaps.

Page 59

83. Liberalize the "design and manufacture only in America" policy.
84. The presently overused metric of "jobs expected to be produced from a CRADA" should be discouraged.

Page 60

85. We call for a true Quality program.
86. There should be a gradual reinvestment by the federal government in repairing research laboratories, and upgrading research instrumentation.
87. Once that [repair of facilities] has been achieved, the responsibility should be turned over to the laboratories.

[Pages 63-66 give a brief summary of many recommendations in the report. They are not restated here.]

Appendix B: If GOCO System is Obliged

P. A-7

88. Base DOE Oversight on laboratories' Performance.
89. Replace compliance-based directives with simple, well-defined performance measures.
90. Eliminate DOE approval of labs' internal procedure documents.
91. Eliminate DOE approval of individual transactions [e.g., in procurement and compensation].
92. Base audits and appraisals on serious risk.
93. Eliminate duplication of audits, appraisals, and reviews.
94. Reward success with decreased oversight.
95. Operate labs according to industry-wide regulatory standards.
96. Eliminate DOE self-regulation.
97. Shift regulatory oversight and inspection functions to responsible federal agency.
98. Eliminate these functions in DOE and reallocate resources.
99. Consolidate roles of DOE oversight offices.
100. Consolidate fragmented headquarters safety roles and responsibilities.
101. Reduce vertical layering of responsibilities for general lab oversight.
102. Delegate oversight to one contracting office per lab, with a well-defined, limited scope of authority.
103. Consolidate or eliminate field offices, at least.
104. Apply rational, consistent business management principles.
105. Institute a multiyear budget process, for both authorization and appropriation.
106. Standardize DOE's budgeting and financial reporting requirements across program offices.

P. A-8

107. Cross-cut budgeting should be examined for appropriateness.
108. Empower labs to locally determine "color of money," except for Congressional mandates.
109. Manage lab infrastructure in a responsible fashion.
110. Re-establish a strong, well-defined landlord function, with one landlord per lab.
111. Consolidate funding sources for infrastructure maintenance and improvement with each lab's DOE landlord.

112. Initiate a multiyear "get well" program for labs' infrastructures.
113. Challenge labs to reduce costs.
114. Allow the quality management programs to become fully applied without outside interference.
115. Strengthen overhead-control efforts.
116. Outsource work based on good business practice for each site.
117. Reengineer administrative processes to fully exploit benefits of modern information systems.
118. Simplify CRADAs much more.

Precedents for Corporatization of the DOE Laboratories

Preliminary Identifications

The Task Force on Alternate Futures recommendation to corporatize the ten (or seven) studied labs was conceptual and general. The members estimated from their limited but relevant knowledge that such form of governance was possible and if so, desirable versus continuation of the GOCO format. The recommendation has attracted some attention as to its doability making it worthy of preliminary identification of additional relevant precedents and related factors.

This paper is offered by the author as an individual citizen's introductory compilation of legal/government organization principles and policies garnered from respected credentialed authorities, professionally retained at no expense to the Task Force or the government. The Task Force as an entity is now retired and has not dealt with this document, whose material was invited and assembled after the Task Force's Report filing February 1, 1995.

Overview

There is considerable legal precedent to support an Act of Congress to institutionalize the Alternative Futures Study Proposal. Precedent, in the form of existing government corporations can be found for most aspects of the legal framework of the Proposal. While many types of entities have utilized these basic structural forms, none is exactly like the proposed Corporation.

There is no need for the repeal or modification of existing laws to establish the Corporation. The legislation authorizing the creation of the Corporation could specifically provide an exemption from existing laws which may be perceived as impeding the achievement of the goals of the Proposal. All of the steps necessary to implement the Proposal can be provided for in the same legislation, together with a statement of policy and a structure for policy-making decisions.

Key Elements of Task Force Proposal Relating to Governance

(1) Replacement of the DOE - supervised GOCO system by a private-sector style "corporatized" laboratory organization substantially outside of DOE (the "Corporation").

(2) Recommended structure; Not-for-profit R&D corporation (or corporations), governed by Presidentially-appointed Board of Trustees, which, in turn, selects CEO and other officers.

(3) DOE, as the government sponsor and "customer," should not serve as auditor or manager of the laboratories. The Corporation will use outside auditors.

(4) DOE will submit a proposed budget to Congress (in line item form, for each of the Corporation's four key missions), for a multiple year period. DOE may also allocate budgeted funds to the Corporation for specific projects. The Corporation will allocate funds among its individual facilities and work groups to perform these projects.

(5) Although DOE will be its primary customer, the Corporation may serve other government agencies, universities, and the private sector.

(6) The Corporation will be subject to "normal" state and federal control of private sector corporations. (The overall intention is to vary from the "federal norm," which includes extensive agency supervision, by conducting a "major experiment" in governance).

(7) The Corporation may hire outside contractors.

(8) Federal Government will continue to bear preexisting liabilities associated with the laboratories.

(9) Transition from DOE to the Corporation through leasing, outright transfer of property or other arrangements. Continued Federal reinvestment in the laboratories to achieve facility upgrade to appropriate level, after which facility upkeep and improvement would become the Corporation's responsibility.

In formulating its proposal, the Task Force never assumed that a cloneable model already existed to exactly fit the recommended corporatization. We called for a "clean sheet of paper" organization design. The purpose of this paper is only to illustrate that the precedent to be flexible and the allowability for such change exists.

The procedures for moving designated activities out of Federal agencies were most recently traced in the Energy Policy Act for the United States Enrichment Corporation. Many of the legal transitional and governance issues to be faced by the Task Force Proposal were raised in this context. It is a model close in some respects to the Corporation.

The corporatization, privatization or management restructuring of several other Federal agencies (e.g., DOE power market agencies, EPA laboratories) is currently under discussion. Policy considerations identified may be relevant to the Proposal.

Certain Factors Relating to Government Corporations

(1) Government corporations are separate legal entities, created by Congress pursuant to the Government Corporations Control Act ("GCCA"). The GCCA is not a general incorporation law; each government corporation has only those powers set forth in its enacting charter. Certain standard provisions are included in almost all government corporation charters, e.g., authority to retain and utilize revenues without fiscal year limitation. More recently formed government corporations have not been bound by some of the limitations contained in the GCCA, such as chartering under the law of the District of Columbia. Exemptions from the Federal Property and Administrative Services Act and from the civil service laws have been provided when deemed necessary to meet the particular government corporation's goals. A recent listing of government corporations is found in Attachment A. While there are elements in several of these corporations that correspond to specific characteristics of the Proposal, none are precisely like the Task Force's Corporation.

(2) The budgets of government corporations have been subject to Congressional approval and to audit by the Comptroller General. Audit reports are submitted to Congress. Government corporations have authority to make a financial commitment without fiscal year limitation.

(3) Mandatory annual reports must document the presence of internal accounting and control systems consistent with the Financial Integrity Act of 1982.

(4) Deviations from either the GCCA or the CFO Act require detailing in the enabling legislation.

The United States Enrichment Corporation - Energy Policy Act

The United States Enrichment Corporation ("USEC") represents a precedent and partial useful model for the implementation of many aspects of the Proposal. It is not described here as a simply cloneable model.

(1) USEC is a wholly owned government corporation under the GCCA and is an agency and instrumentality of the United States.

(2) It has full business corporation powers under a District of Columbia business charter, including the right to conduct R&D in support of its business objectives. (As a commercial enterprise, it is expected to operate on a profitable and efficient basis, and to be self-financing.) The Task Force proposal is for a non-profit corporation.

(3) The Directors of USEC, none of whom are USEC employees, are presidential appointees and are compensated on a Per diem basis. The Board-appointed officers and employees are non-Civil Service, and their compensation is fixed by the Board. The law provides for a Transition Manager exercising the powers of the Board until the Board is appointed.

(4) The financial statements of USEC are subject to an annual independent audit in accordance with GAO standards. GAO may also conduct its own audit. An Annual Report to Congress is required.

(5) Certain federal laws, e.g., environmental, Davis-Bacon, OSHA and anti-trust, are specifically made binding on USEC. USEC is not subject to the Federal Property and Administrative Services Act related to disposal of government property. Provision is made for a transfer of contracts, leases and agreements from DOE and for the leasing of certain assets from DOE at cost.

(6) In connection with the lease of a gaseous diffusion plant, DOE remains responsible for preexisting conditions, as documented by an environmental audit. More broadly, the USEC statue

leaves with DOE all liabilities and judgments with respect to pre-transition operations.

(7) Further provision is made for privatization of USEC pursuant to a strategic plan which is to be developed during a two-year transition period. Statutory criteria for privatization are laid out. Privatization may be effected only with Presidential approval and after Congressional review of a GAO report. The Task Force deliberation did not contemplate this possibility in the foreseeable future.

(8) The statute authorized USEC to determine whether to proceed with the commercialization of certain uranium enrichment technology.

(9) Certain Implications:

(a) USEC is illustrative of the flexibility with which DOE assets could be redeployed into a government corporation. USEC has a Board and a Chief Executive similar to that proposed by the Report. Its liability management features are similar to those envisaged by the Report.

(b) USEC differs from the proposed Corporation in that it is a business enterprise intended to function competitively. It will not undertake long-term R&D responsibilities, except as explicitly contemplated by statute.

(c) A transitional planning mechanism of the type prescribed for USEC may be helpful in the DOE laboratory context.

Submitted by

Robert W. Galvin
Chairman of the Task Force
and
An Executive of Motorola Inc.

ATTACHMENT A

GOVERNMENT CORPORATIONS

Under the Government Corporations Control Act (31 U.S.C. §§ 9109 *et seq*. (1994)), "government corporations" includes mixed-ownership and wholly owned government corporations.

Mixed-ownership government corporations are:

(A) Amtrak.
(B) the Central Bank for Cooperatives.
(C) the Federal Deposit Insurance Corporation.
(D) the Federal Home Loan Banks.
(E) the Federal Intermediate Credit Banks.
(F) the Federal Land Banks.
(G) the National Credit Union Administration Central Liquidity Facility.
(H) the Regional Banks for Cooperatives.
(I) the Rural Telephone Bank when the ownership, control, and operation of the Bank are converted under § 410(a) of the Rural Electrification Act of 1936 (7 U.S.C. 950(a)).
(J) the United States Railway Association.
(K) the Financing Corporation.
(L) the Resolution Trust Corporation.
(M) the Resolution Funding Corporation.

Wholly owned government corporations are:

(A) the Commodity Credit Corporation.

(B) the Community Development Financial Institutions Fund.

(C) Export-Import Bank of the United States.

(D) the Federal Crop Insurance Corporation.

(E) Federal Prison Industries, Incorporated.

(F) the Corporation for National and Community Service.

(G) the Government National Mortgage Association.

(H) the Overseas Private Investment Corporation.

(I) the Pennsylvania Avenue Development Corporation.

(J) the Pension Benefit Guaranty Corporation.

(K) the Rural Telephone Bank (until the ownership, control, and operation of the Bank are converted under section 410(a) of the Rural Electrification Act of 1936 (7 U.S.C. 950(a)).

(L) the Saint Lawrence Seaway Development Corporation.

(M) the Secretary of Housing and Urban Development when carrying out duties and powers related to the Federal Housing Administration Fund.

(N) the Tennessee Valley Authority.

(O) the United States Enrichment Corporation.

SOURCE: Government Corporations Control Act, 31 U.S.C. §§ 9101 et seq. (1994)

Alternative Futures for the Department of Energy National Laboratories

Prepared by the

Secretary Of Energy Advisory Board

Task Force on Alternative Futures for the

Department of Energy National Laboratories

February 1995

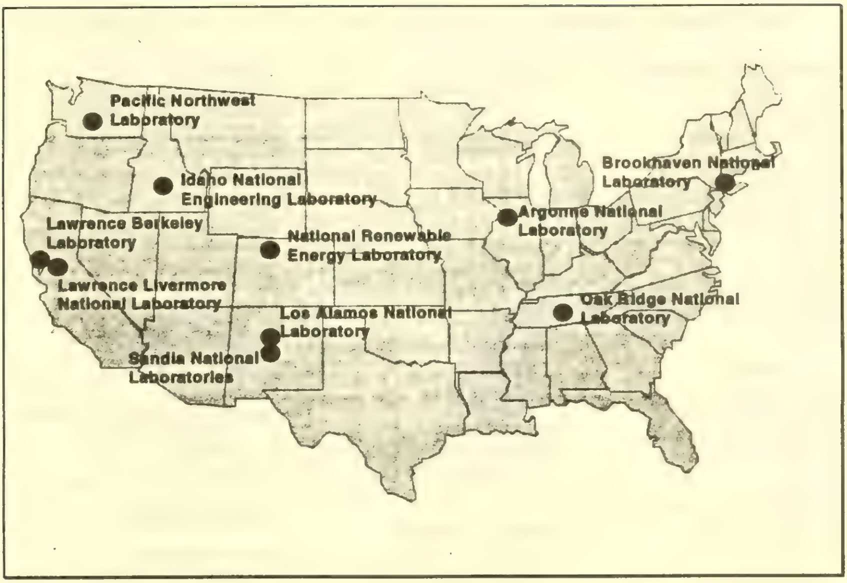
Pacific Northwest Laboratory
Idaho National Engineering Laboratory
Lawrence Berkeley Laboratory
Lawrence Livermore National Laboratory
National Renewable Energy Laboratory
Los Alamos National Laboratory
Sandia National Laboratories
Argonne National Laboratory
Brookhaven National Laboratory
Oak Ridge National Laboratory

Figure 1. Department of Energy National Laboratories Under Consideration by the Task Force

A Reader's Guide to the Report

This report contain many suggestions, the subtleties and significance of which require the reading of all of the necessarily long text. However, the underlined phrases and sentences throughout the document provide a useful scan and outline of the content as a guide to key subject material and the surrounding location in the text that amplify that meaning.

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Appendices

A. EXCESSIVE OVERSIGHT AND MICROMANAGING

B. IF GOCO SYSTEM IS OBLIGED

C. TERMS OF REFERENCE

I. Overview

A. Introduction

This Task Force was asked to propose alternate futures for the Department of Energy laboratories noted in Figure 1(see inside front cover). The Task Force Charter is provided in Appendix C. Our intensive ten months' study revealed multiple missions and sub-missions – traditional missions and new missions – programs and projects – each with factors of merit. Each iteration of our study would nevertheless still confound even the members of the Department and laboratory community, as evidenced by the oft-quoted statement: "the laboratories, and indeed the Department, require a clearer, more focused statement of mission!". Our sorting of these matters has led us to a synthesis which when first revealed may appear too simple, too limiting or even too much of a play on words. But we respectfully suggest that this synthesis identifies an essence – the essence of what the Department, and particularly the laboratories, should and do stand for: the energy agenda.

Virtually everything the laboratories do "is" energy. The original laboratories' first assignment was a nuclear energy bomb – developing the fuel, storing and containing the energy, and releasing the energy. More laboratories were formed and/or augmented in response to other energy needs which occasionally were identified as crises. Newer laboratories have credentials (among other credentials) for conservation and renewable energy. Most of the laboratories are concerned and resourced to deal with the various effluents of energy and its applications *vis-a-vis* the environment. The aggregate of science and technology competencies of the laboratories has served, and continues to serve, as one essential resource for the study of energy.

At many given points in time energy is the paramount issue in our lives. A blackout in a nearby neighborhood or industrial plant is always headline news. Long lines of vehicles responding to (infrequent) fuel shortages capture everyone's self-interest. Although we are privileged to more often take energy availability for granted in the United States, we still press for longer battery life for our cellular phones and worry that some day we will run out of petroleum. Energy is so central to the vitality of our dynamic country that it has to be a priority concern as an ongoing national strategic issue. It may be legitimately referred to as an issue of importance to our general long-term national security.

As we were in the latter stages of writing this report, occasional speculation surfaced concerning the continuing role of the Department of Energy, and suggesting in part that energy is not all that important. Such major agency structure issues are beyond our purview, but we do feel justified in asserting that the energy agenda which we will profile in this report does require central, federal, senior cognizance and appropriate government sponsorship in the interest of the short-term and long-term overall quality of life in America and the world. We will shortly make the point that the laboratories are essential (with appropriate changes, of course) in these regards. The laboratories we studied require a strong federal financial support and linkage or sponsorship, at least for a goodly number of years, for reasons that will be evident throughout this report. The Department can serve this role, appropriately redefined, well.

Returning to the subject of mission, we find ourselves comfortable with a mission whose meaning is bound up in serving energy opportunities. We introduce the thought with words that are not capitalized because we do not want to presume to capture as graphic art an all-encompassing meaning in a few short words. Nor do we believe that the Department or laboratories have been adequately served by articulating virtual slogans in some of its noble efforts at projecting its purposes. Yet, even if one flashes the message "Serving the Energy Opportunities" on the proverbial screen, in its own quiet way it conveys what almost every other existing mission or program or project intended.

Let us narrow in on the word *energy* and its meaning. The word serves as the remarkable root word for defining mission(s) within a progressive parameter. At one and the same time, it gives focus and gives a wide-ranging field of relevant explorations.

Elsewhere in this report one will find our recommendation of need for focus – a parameter of sorts to the roles of the laboratories. Yet it is not inconsistent that simultaneously we recommend the laboratories must be free to renew and press the frontiers in all relevant affordable ways in behalf of their energy agenda, broadly defined.

Our working definition of Energy is: Energy is the capacity to do work. The Physical, Chemical, and Biological Sciences which are used to derive fuels from natural resources are in turn enabled by Energy. Conventional energy sources include wood, water, oil, gas, coal, and nuclear fuels. The growing U.S. and world population requires all these, as well as new source such as solar energy, biomass, and wind energy. All must be made clean, safe, less expensive, and in the aggregate, abundant. Energy may be sourced centrally, locally, or portably. It must be generated, transformed, distributed, and properly utilized from all these sources. Future sources may include, for example, hydrogen, which is abundant in water, gas, and biomass; albeit a challenge to "extract" and store. DOE laboratory scientists have decades of experience with hydrogen and other basic sources. Their multidisciplinary competencies hold the promise of solving many such challenges.

The rest of the world has an energy agenda of sorts as well. This agenda is to obtain for their people access to energy supplies comparable in all respects to those we now enjoy. This global energy agenda represents a huge opportunity for the U. S. energy industries. It also represents a competitive threat to those industries if they have not prepared and committed first to serve the right "product." Finally, it represents a threat to our country and other countries if some nations employ technologies for energy production and usage which increase global pollution levels. Our purveyors to those expanding producing and using societies must be prepared to offer better. While serving the needs of our country with the leading edge of technology, we can best serve the needs of other countries, both environmentally and commercially, when we support them with technologies derived or derivable by the laboratories. All these self-evident contributions from the laboratories are in addition to the national security, defense and weapons stewardship role that gave birth to the first laboratories. This latter role will be a continuing irrevocable obligation for a minimum of two score more years.

The laboratories' research role is a part of an essential, fundamental cornerstone for continuing leadership by the United States. We know that the studies and discoveries of science unravel the elements of nature and shower benefits on mankind. We know by intelligent estimates that there is much more to be learned and shared. We know that these scientific revelations will unfold from many sources: a brilliant insight by an individual, a research team at a university, a corporate or government laboratory – by accident, or on purpose. We know progress is hastened where diversity of personnel and institutions is encouraged.

We note that many of the least exploited investigative paths involve the need for extraordinarily sophisticated multidisciplinary teams using sophisticated instruments and tools. It is that role for which the national laboratories are uniquely qualified. It is the case for – the justification of – the existence of the DOE laboratories.

Yet most citizens do not know enough about the laboratories. We do not know the thousands of insights, new directions, new phenomena, new principles, materials and processes that blanket these laboratories' science spectrum, all relevant to an energy agenda. Examples include the world's most intense X-ray sources; biomedical isotopes; chlorofluorocarbon substitutes; computer models of combustion for cleaner energy; laser isotope separation; lasers for pollution monitoring; neutron sources to probe materials and biological systems; the unraveling of the puzzles of the human genetic code; the harnessing of the wind, sun and earth for renewable energy; superconductivity; global ocean and atmospheric studies; detection and tracking of nuclear materials; fossil, fission, fusion energy; novel semiconductor materials and devices; laser destruction of blood clots; bioremediation of radioactive and hazardous waste; accelerator technology for medical applications; and remediation of radioactive storage tanks. These are but a few examples.

We are inclined to typecast these institutions simplistically by a few prominent contributions such as yesterday's bomb or the discovery of an element on the periodic table (both grand achievements), but overlook the multitude of other continuing achievements. We must reach out to know enough of this vast spectrum of accomplishments to justify our deserved support of these institutions that have contributed, are contributing, and will in the future contribute vital knowledge while continuing to revitalize themselves – just as science always renews itself. We must be in quest of that which we do not know in the field of science in every relevant way. Each revelation will enrich us manyfold. The laboratories we review here are essential to the fulfillment of our need to know.

Under the overarching energy agenda – the labs serving the energy opportunities – we will comment on their national security role, the all important energy role, all related environmental roles, the science and engineering underpinning for all the above, a focused economic role, and conclude with governance / organization change recommendations.

B. Missions of the National Laboratories

The Task Force believes that a change of governance of the national laboratories is necessary regardless of the missions of these multi-program institutions. However, we also have strong views regarding the appropriate mission activities for the laboratories. One general observation of the Task Force is that the national laboratories, and the Department, appear to believe that they have the potential to serve an extraordinarily broad role in scientific investigation and technical research for the nation. The Task Force does not support this view. Rather, we see the laboratories as having clear areas of expertise, yet limited to their traditional mission areas of national security, energy, and environmental science and technology, as well as in the fields of fundamental science which underpin these missions and in basic science associated with high energy, nuclear, and condensed matter physics.

While the Task Force supports innovative application of the national laboratories' core technical competencies (for example, high performance computation, advanced materials, energy technologies, and systems engineering) to new problem areas, these activities should be carefully managed, are not likely to evolve into "new missions" per se, and should not be a license to expand into areas of science and technology which already are being addressed effectively or more appropriately by other Research and Development (R&D) performers in government, academia and the private sector.

The Task Force does believe that the national laboratories serve a distinctive role in conducting long-term, often high-risk R&D, frequently through the utilization of capital-intensive facilities which are beyond the financial reach of industry and academia, and generally through the application of multidisciplinary teams of scientists and engineers. We believe that an appropriate division of labor among the national laboratories, industrial research institutions, and research universities can be established but does not sufficiently now exist.

The Task Force concluded that the work of these laboratories contributes in an important, though generalized fashion to the security interests of the nation, when security is defined broadly to include factors such as:

- Developing technologies which enhance the ability of the nation to deter and defend against military threats, to reduce the nuclear danger, and enhance confidence in our own nuclear weapons in the absence of explosive testing;

- Enhancing the prospect for sound patterns of energy use through the development of diverse, efficient, and sustainable energy technologies;

- Reducing environmental threats posed by the waste legacy of the nuclear weapons program and by the careful utilization of energy and materials throughout the economy; and,

- Expanding the base of scientific information – which is one of the nation's greatest long-term strategic assets – through pioneering work in a number of areas of fundamental science mostly related to the energy agenda.

One general observation about the missions of the laboratories is that the Task Force found it ironic that these institutions seem to be searching so hard for "New missions" when there remains a compelling agenda of important work to be performed in their traditional mission areas. The Task Force believes:

- The existing budget of the national laboratory system exceeds that required to perform its agenda in the areas of national security, energy, environment, and fundamental science;

- It is unrealistic for these institutions to attempt to retain their current size by laying claim to "new missions;" and,

- The urgent requirement for these laboratories is to provide more disciplined focus on the new research needs within the traditional set of mission areas, as described below. .

Later we identify savings through reorganization which can be variously used to reduce budget, redeploy resources, and increase research in appropriate areas.

1. National Security

The primary national security mission of the DOE laboratories is to provide for a safe, secure and reliable nuclear stockpile in the absence of explosive testing of nuclear weapons. Continued scientific, engineering, and managerial excellence will be required at the laboratories to meet the complex and demanding stewardship role. A vital extension of this mission involves work in non-proliferation, counter-proliferation, arms control verification, and intelligence support. Another critical and daunting national security task for which the weapons laboratories have special expertise involves the safe tracking and disposition of fissionable materials.

2. Energy

The primary mission for the laboratories in relation to energy technologies is to pursue a research and technology development agenda which enhances the long-term prospects for adequate energy supplies and efficient end use technologies which minimize adverse environmental impacts. The primary role for the laboratories should be in areas where long-term research holds the prospect for significant payoffs, and where a clear public purpose is being served through Federal support. To the maximum extent possible, energy R&D at the laboratories should be coordinated with the private sector and be guided by technology road maps.

3. Environmental Science and Technology

The Department faces a monumental task in dealing with the radioactive and hazardous wastes at its former nuclear weapons production sites and national laboratories. This task cannot be addressed in an affordable fashion using today's technologies. The national laboratories have expertise and untapped potential which could accelerate the scientific and technological base which is urgently needed for the cleanup mission.

The laboratories also have significant contributions to make in research and development related to more efficient utilization of energy and materials, such as pollution prevention and waste minimization techniques, and also in areas associated with the environmental impacts of energy use, as in global climate modeling. The Task Force believes that the laboratories have areas of demonstrated expertise that could provide the basis for an expanded mission in environmental research and technology development, but such expansion should occur only in areas where the laboratories have a comparative advantage to other R&D performers in academia, industry, or other government agencies.

4. Fundamental Science

The national laboratories have a major mission to serve in contributing to the scientific foundation which underpins the Department's other mission areas: national security, energy, and the environment. The laboratories also have important responsibilities in certain discrete areas of science for which mission applications are not immediately apparent– such as in high energy, nuclear, and condensed matter physics– but where contributions to the nation's scientific enterprise have been significant.

Such contributions often have derived from large-scale scientific user facilities that have been built and operated at the national laboratories (as well as at the Department's program-dedicated laboratories). Such facilities have enabled government, academic, and industrial researchers to explore scientific frontiers that have not been accessible in other ways. Long-term, fundamental research of this form has been part of the national endeavor to create a better future through investments which could have a transforming, yet unknowable impact on society. The Department should sustain and strengthen its support of fundamental science.

5. Industrial Technologies

Development of technologies for which private sector companies are the major beneficiary is not an appropriate mission for the national laboratories. Rather, the economic impact of R&D performed for such general benefit by the national laboratories should be viewed as a derivative, or outcome, of the other core missions. Collaborations between the national laboratories and the private sector serve the important function of providing dual benefits to the partners, but such collaborations generally should be closely aligned with core mission areas of the Department. To the extent appropriate, such collaborations should be cost-shared and tied to technology road maps developed by and with industrial sectors.

C. Laboratory Governance

Our study revealed a counterproductive federal system of operation (Department, Contractor, Laboratory and substantially driven by Congressional policies). A far-less-federal system must be authorized by the Congress, adopted by the Department and implemented at the laboratories, possibly involving contractors. Certain far-less-federal systems promise large productivity gains with attendant major economies along with refreshed motivation by empowerment of the laboratory's greatest assets – its devoted professionals. We urge embracing such a new concept promptly, adopting one or more new configurations early, and moving into a perfectible system apace, much as many non-federal institutions are doing with rich rewards.

The Task Force observed multiple symptoms of institutional stress at the national laboratories, including the following:

- Increasing overhead cost, poor morale and gross inefficiencies as a result of overly prescriptive Congressional management and excessive oversight by the Department;

- Inordinate internal focus at every level of these laboratories on compliance issues and questions of management processes, which takes a major toll on research performance;

- Excessive scrambling by the laboratories to establish programmatic activities in "new mission" areas, at the expense of disciplined focus on traditional assignments in national security, energy, waste management and environmental quality, and fundamental science;

- Confusion regarding the appropriate character, scope, and scale of laboratory collaborations with the private sector, due to a lack of clear policy guidance from the Department;

- Institutional fragmentation as a direct reflection of segmented management of the laboratories by the Department, which treats the laboratories not as integrated institutions – let alone a system of laboratories – but rather as a conglomerate of hundreds of individual projects, each of which has a program manager with independent influence on elements of the laboratories;

- Financial and institutional burdens on the laboratories as the result of an apparent inability by the Department either to downsize facilities which have excess capacity or to terminate programs which provide neither distinctive nor essential contributions to the national research and development enterprise; and,

- Management systems at the laboratories that do not exhibit best business practices, and thus compound the management challenges of these complex institutions.

The Task Force recognizes that many of the Department's laboratories are considered to provide some of the highest quality R&D among the federal laboratory system. With this understanding, the Task Force had the option of simply concluding that the problems facing the national laboratories were simply a fact of life of federal governance and that little more could be expected. The Task Force has no comfort with such an assessment, feels that it is reasonable, and indeed necessary to have much higher expectations for performance from these institutions, and believes that incremental solutions will not likely provide the major improvements that are, at once, achievable and necessary.

We arrived at this conclusion recognizing that conventional wisdom likely would provide a range of reasons why establishing a new system of governance for the laboratories might be impractical or jeopardize these assets. In our view, however, the long-term quality and effectiveness of these laboratories already is in serious jeopardy, owing to patterns of management and organization that have grown in complexity, cost, and intrusiveness over a long period. For those who have been long time employees, managers, or observers of the national laboratory system, perhaps it is easy to rationalize that the system in place is simply the way it is and the way it always will be. For those without lengthy associations with the Department or its laboratories – which was the case for a majority of the Task Force members – it is hard to reach any conclusion other than that the current system of governance of these laboratories is broken and should be replaced with a bold alternative. The Task Force seeks not to be bold for boldness sake, but because it believes that a far more effective system of governance is necessary.

While this report provides a general description for a not-for-profit framework for governance of the laboratories, we do not presume to know what the precise alternative architecture should be. That can and should be developed by Congress, the Department, and the laboratories, based on experience gained from existing research institutions which receive substantial funding support from the Federal Government, but which have an independent management structure which makes the decisions on how best to deliver the services which the Government is procuring. Insight also should be gained from the experiences of other nations, including the United Kingdom, which recently has maneuvered a disengagement of several of its government laboratories into a semi-privatized status.

A major experiment implementing wholly new management practices for the national laboratories does invite risks, and certain hazards must be recognized and guarded against within any implementing legislation. For example:

- Those national laboratories that work on nuclear weapons programs may not be appropriate candidates for transfer to a non-federal governance structure, especially given the need for continued stringent controls on all aspects of nuclear weapons design activities. Some Task Force members think they are. Some think they are not.

- The proposal to introduce a bold new paradigm for governance of these institutions must not be used as a political pretext to dismantle or destroy a system of laboratories which has served the nation well in the past, are continuing to perform important public functions, and holds the prospect for delivering new scientific insights and technological innovations which will justify its continued value to the Nation.

- Protection must be built into the governance structure to ensure that these institutions continue to perform long-term, fundamental research – which is among their most distinctive contributions to the nation – and not be driven to a short-term focus characteristic of "job shops" for the private sector. This goal could be reached through prescribed allocations which provide an inviolate base of federal funding support for certain critical areas of fundamental research and their associated large research facilities.

- It will be necessary to ensure that the change in governance is structured in a fashion to achieve the desired results, and that the new system not be burdened by creeping micromanagement, non-productive oversight, and institutional fragmentation which characterizes the present state of affairs at the national laboratories.

- A balance must be achieved between the need for necessary continuing oversight and reduction of environmental damage on the one hand, and the need for avoiding overwhelming the new organizations with excessive burdens and inherited environmental responsibilities on the other hand.

D. Configuration of the Laboratories

The Task Force believes that the national laboratory system is oversized for its current mission assignments. This appears to be the result of inefficiencies that stem from the current management practices of the laboratories and the DOE; excess capacity in areas associated with nuclear weapons design and development; and political considerations which have inhibited downsizing and laboratory restructuring. The Task Force believes that the national laboratory system serves many vital functions, but that the system could be productively downsized (or "rightsized") through the elimination of functions and redundancies. The Task Force further believes that one goal of any downsizing should be enhanced focus on specific mission assignments. Through downsizing, there may be opportunities in the future to convert one or more multi-program laboratories into institutions dedicated to only one primary mission.

The Task Force strongly believes that the laboratories should work more closely as a system, with the goal of achieving enhanced coordination and integration of complementary strengths. However, we note that such coordination will be made more difficult to the extent that the laboratories are separated into independently operated not-for-profit organizations.

While the Task Force does not make any recommendations about the possible closure of specific laboratories, we have a general view that all of the national laboratories should be subjected to a regular process of comparative validation against other research performers (including against each other) to judge options for closure, consolidation, and even expansion of programmatic activities and facilities. The Task Force believes that an alternative structure of governance for the laboratories that achieves greater independence of the laboratories from the Department would invite enhanced pressures for competitive performance, which would lower costs, force the elimination of redundancies and less than world-class capabilities, and achieve enhanced value for the public investments involved.

II. The National Security Role

A. Introduction and Background

1. The Changing Environment

The Department of Energy's national security mission is based on the Manhattan Project, the development of nuclear weapons during and following World War II. The legacy includes independent design capabilities, redundant design teams, competition, and intense efforts to achieve the highest standards of safety, surety and reliability. The three weapons laboratories – Lawrence Livermore, Los Alamos, and Sandia National Laboratories – have evolved over a period of more than fifty years. It is clear that they played a key part in the successful outcome of the nuclear standoff with the former Soviet Union. For this, the entire nation owes a debt of gratitude to the women and men of these laboratories, past and present, who gave their talent to this successful endeavor.

The end of the Cold War has brought substantial change. Weapons modernization, arms control agreements, the fear of proliferation of weapons of mass destruction, and the significant decline in defense spending require a restructuring of the laboratories' support for the national security mission. Today, these laboratories represent an extraordinary national resource of people, facilities, and experience. Every attempt should be made to use this resource as missions change.

2. National Security Requirements

The requirements for the DOE and the weapons laboratories are based on Presidential direction as approved in the Nuclear Stockpile Document and other Presidential Decision Directives. Congress provides direction in laws and committee reports. The Department of Defense (DOD) determines specific weapons requirements and the Department of Energy determines how to fulfill those requirements. The weapons laboratories then are assigned specific responsibilities and funding to carry out DOE direction.[1]

The President stated in the National Security Strategy (July 1994) that a safe, secure and reliable U.S. nuclear deterrent remains a cornerstone of U.S. national security policy. The President announced a moratorium on underground nuclear testing with a goal of establishing a comprehensive test ban. He instructed the DoD and DOE to explore means other than nuclear testing to maintain confidence in the safety, reliability and performance of the weapons stockpile. He also directed strong efforts to support the Non-Proliferation Treaty and counter weapons of mass destruction. This direction is the basis for DOE and DoD planning for the future and the Task Force's consideration of alternate futures for the weapons laboratories.

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[1] The weapons laboratories are Lawrence Livermore National Laboratory (LLNL), Los Alamos National Laboratory (LANL), and Sandia National Laboratories (SNL). LLNL and LANL are weapons design laboratories while SNL is the engineering laboratory.

The maintenance of a safe, secure, and reliable stockpile, contributions to critical proliferation and treaty issues, and participation in other national priorities related to this mission are essential parts of the nuclear weapons laboratories' future and require adequate facilities, motivated and capable people, and the requisite budget. This future will require new types of management, different technical personnel, and a mode of operation that is closer to industry's than the laboratories have practiced in the past.

3. Specific Weapons Requirements

The Department of Defense conducted a Nuclear Posture Review[1] , approved by the President, to determine future nuclear forces and weapons requirements. Implementation of the START I and START II protocols will result in a total nuclear weapons reduction of 79% by the year 2003. As a unilateral action (Presidential Nuclear Initiatives I and II), the U.S. will reduce by 90% non-strategic nuclear weapons. These steps will result in a required stockpile of around 5000 weapons.

The Nuclear Posture Review identified the need for flexibility either to accelerate the drawdown if both sides implement START II more quickly, or the ability to return inactive weapons to service if the Russians suspend or delay START II implementation. The weapons laboratories need the capability to respond to either circumstance.

Over the past two years, the Department of Energy has established the Science-Based Stockpile Stewardship Program, replacing a test-based stockpile stewardship, to maintain confidence in nuclear weapons without nuclear testing. The focus of the new program includes improving experimental capabilities, enhancing computational capabilities, advanced stockpile surveillance, advanced manufacturing and materials capability, maintaining system engineering and infrastructure and preserving a nuclear design and experimentation capabilities.

B. Main Findings and Recommendations

Specific recommendations regarding the future of the weapons laboratories fall into broad categories of mission, key personnel, configuration, peer review, basic science, research facilities, and weapon production (including research, production, tritium, and management). The Task Force believes that these recommendations are consistent with Presidential Directives,[1] the Nuclear Policy Review, and the Science-based Stockpile Stewardship Program.

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[1] **Brigadier General Anthony Tolin, USAF, Strategy and Policy, Joint Staff, private briefing on the Nuclear Posture to the National Security Subgroup of the Task Force, October 14, 1994.**

1. Mission

The national security mission of the weapons laboratories has been rearticulated to emphasize maintaining credibility in the U.S. nuclear stockpile in the absence of explosive testing of nuclear weapons. The primary mission of the weapons laboratories must be a safe, secure, and reliable stockpile. Science-based stockpile stewardship (in comparison to a test-based stockpile program) is the approach chosen by the Department of Energy to achieve this mission. It requires the following rank-order priorities for the core functions of stockpile stewardship as follows:

1. Attracting and retaining skilled scientists, engineers, and managers over the years ahead with the expertise required for the complex and demanding stewardship role;

2. Enhancing surveillance of weapons in the stockpile[2], during dismantlement, and of the nuclear materials that accumulate as a result of that dismantlement;

3. Continuing hydrodynamic testing as required to cope with problems;

4. Assessing problems, reanalyzing previous data through numerical simulations, and developing appropriate data bases; and

5. Sustaining the scientific process of inquiry through experimentation.

In today's world, proliferation of nuclear and other weapons of mass destruction remains a major threat to U.S. national security. Because of this threat the DOE laboratories' work in non-proliferation, counter-proliferation, verification, and intelligence support has become a major mission as well as an extension of their stewardship of the nuclear stockpile. These activities are supported by the expertise maintained within the entire nuclear weapons infrastructure. It is important that their funding be included within the core infrastructure support. The Task Force notes that organizational compartmentalization within the Department complicates and makes difficult the appropriate inter-relationship and funding balance between stockpile support and non-proliferation, and recommends that the Department's organization reflect their importance and interdependence.

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[1] Steven Andreasen, Strategic and Nuclear Affairs, National Security Council, private briefing on Presidential Decision Directives to the National Security Subgroup of the Task Force, August 9, 1994.

[2] Current weapons designs are secure, safe and reliable. There is no threat to the nation that would justify the development of a new nuclear weapon at this time. If weapons in the stockpile should develop problems that cannot be resolved, and that raise doubts about their reliability or safety, consideration could be given to the option of replacing them with modernized versions of earlier, very robust, well-tested designs. However, the safety and reliability record of the stockpile indicates the successful resolution of all past weapons problems; any future reliability or safety problems should be first analyzed and solved -- if possible -- by the replacement of specific components or addition of new safety features if needed.

2. Attracting and Retaining Scientists, Engineers, and Managers

The weapons laboratories' management has an important responsibility to identify the critical skills required for their national security mission and to manage the hiring and retention of key personnel accordingly. The Task Force recommends that management continue to sustain a stimulating intellectual environment that will attract and retain the very best research and engineering staff. This will require:

- Providing appropriate rewards for high performers;
- Weeding out weaker performers; and,
- Engendering in the research and engineering staff a sense of achievement, based on personal responsibility and personal accountability.

3. Configuration of the Nuclear Weapons Laboratories

The current structure of the three nuclear weapons laboratories should be examined in light of the recently revised, official U.S. Nuclear Posture. The Department of Energy should size its nuclear weapons laboratories support efforts over time to match DoD requirements. The restructuring must be accomplished in ways that preserve capabilities both for reduction to lower levels of support and for an expansion of support should the resumption of a threat to national security demand it. In addition, the restructuring must support the requirement to maintain confidence in the nuclear stockpile in a comprehensive test ban or under an extended moratorium. The restructuring will affect primarily weapons design capabilities, where the largest functional redundancy exists, and specifically Lawrence Livermore National Laboratory (LLNL); LLNL supports only four of eleven weapons designs currently in the U.S. stockpile.

The Task Force believes LLNL should retain enough nuclear weapons design competence and technology base to continue its activities in non-proliferation, counter-proliferation, intelligence support, and verification, to provide independent review for several years while alternative approaches to peer review are developed (see "Peer Review"), and to participate in weapons relevant experiments on the National Ignition Facility (NIF). LLNL would transfer, as cost-efficiency allows, over the next five years its activities in nuclear materials development and production to the other design laboratory. LLNL would transfer direct stockpile support to the other weapons laboratories as the requirements of science-based stockpile stewardship, support of the DoD nuclear posture, and the status of test bans allow. Under these conditions, the Task Force believes that the transfer can be made in five years. The Task Force notes that if the NIF is built at LLNL, this will reinforce the weapons design capability at that laboratory.

4. Peer Review

The Task Force believes that the development of independent assessment of the safety and reliability issues within an aging stockpile will be an ongoing requirement of stockpile stewardship. It also believes, however, that there are many ways in which this peer review function can be served, and that peer review, in and of itself, does not justify the existence of two nuclear design laboratories.

5. Contributions to Basic Science

As new facilities are developed at the weapons laboratories for performing science-based stockpile stewardship, the Task Force recommends that these facilities be managed in as open and collaborative a fashion as national security constraints will permit.

6. Major Research Facilities

The Task Force recommends the following:[1]

- Continued funding support for the Dual-Axis Radiographic Hydrodynamic Testing (DARHT) facility;
- Continued near-term support for Los Alamos Neutron Scattering Experiment/Los Alamos Meson Physics Facility (LANSCE/LAMPF);
- Continued pursuit of advanced computing, including computing through workstation networks; and,
- Proceeding with the National Ignition Facility (NIF) as a research facility, prioritized with respect to other major research investments.

In its favor, NIF will provide a unique means for doing very important experiments involving extremely high temperatures in condensed matter physics and it thus will make it possible to maintain expertise in one of the areas of physics fundamental to modern nuclear weapons design. Similarly, the data and theory it will produce will contribute uniquely to science generally and to astrophysics in particular. On the other hand, there is some possibility that NIF will inadequately simulate secondaries, although this is already a lower priority than understanding primaries. There is a low probability that inertial fusion will become a useful source of energy in the foreseeable future. NIF may not attract the scientists and engineers that stockpile stewardship really needs. NIF may also complicate discussions at the Non-Proliferation Treaty review conference and negotiations of a Comprehensive Test Ban Treaty. In short, NIF is a risk (as are most major research projects), but on balance the Task Force supports its construction. An important consideration is that the question of whether or not NIF is built at LLNL, when combined with other recommendations for change given in this report and elsewhere that could define the future of that laboratory.

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[1] The Jason Stewardship report entitled Science Based Stockpile Stewardship, August 10, 1994.

7. Non-Nuclear Research Requirements

The Task Force recommends that non-nuclear research activities continue at the weapons laboratories as long as a paying customer requires them, as they are rooted in nuclear weapons research, contribute to core R&D, and pay their fair share of overhead and basic research support.

8. Nuclear Weapons Production Capacity

There is no need for nuclear weapons production at this time nor is start-up of production envisioned for problems expected in the stockpile. Capability-based deterrence requires, however, the potential for weapons production in the event of increased threat that may arise in the future. The current world situation and the existing production capability do not mandate investment in additional production capability. The Task Force recommends that future production should be based on the residual capabilities of Pantex, Los Alamos National Laboratory, and Sandia National Laboratories, and believes that no further investments in production capability are needed at this time.

9. Tritium Supply

Accelerator-based production of tritium looks attractive, given today's understanding of the technology. The Task Force, however, does not make a recommendation relative to replacement, or to the mode of production, but rather supports continued R&D in accelerator-based production of tritium.

10. Management of the Nuclear Weapons Laboratories by DOD

As requirements for national security change, DoD and DOE must size their organizations and improve their coordination for maximum effectiveness. The DoD must act as an intelligent and prudent customer regarding nuclear weapons. The separation, within the U.S. government, of nuclear weapons development and operations is a long tradition and has recently been challenged in the interest of efficiency. The Task Force, however, agreeing with most previous studies of this issue, sees no compelling reason for DoD to manage the national security activities at the weapons laboratories. Indeed, the Task Force believes that there is much value at this time in maintaining an independent and technically expert organization to focus on nuclear stockpile issues and to continue to ensure that decisions regarding the safety, control, and stewardship of nuclear weapons are raised to the high policy level that they deserve. The corporatization proposal contained in Section VII in the Task Force report could eliminate the management issues for both DoD and DOE and give a customer focus to the weapons programs.

C. Summary of Recommendations

1. *The primary mission of the weapons laboratories must be a safe, secure and reliable nuclear stockpile in the absence of explosive testing. Science-based stockpile stewardship is the approach chosen be the Department to achieve this mission. It requires the following rank-order priorities:*

    - Attracting and retaining skilled scientists, engineers, and managers over the years ahead with the expertise required for the complex and changing stewardship role;
    - Enhancing surveillance of weapons in the stock pile, during dismantlement, and of the nuclear materials that accumulate as a result of the dismantlement;
    - Continuing hydrodynamic testing to cope with problems;
    - Assessing problems, reanalyzing previous data through numerical simulations, and developing appropriate data bases; and
    - Sustaining the scientific process of inquiry through experimentation.

2. *Non-proliferation, counter-proliferation, verification, and intelligence support have become a major mission along with stewardship of the nuclear stockpile. The Task Force notes that organizational compartmentalization within the Department complicates and makes difficult the appropriate inter-relationship and funding balance between support and non-proliferation, and recommends that the Department's organization reflect their importance and interdependence.*

3. *The Task Force believes Lawrence Livermore National Laboratory should retain enough nuclear weapons design competence and technology base to continue its activities in non-proliferation, counter-proliferation, verification, and intelligence support, to provide independent review for several years while alternative approaches to peer review are developed, and to participate in weapons relevant experiments on the National Ignition Facility (NIF). Lawrence Livermore National*

Laboratory would transfer as cost-efficiency allows over the next five years its activities in nuclear materials development and production to the other design laboratory. Lawrence Livermore National Laboratory would transfer direct stockpile support to the other weapons laboratories as the requirements of science-based stockpile stewardship, support of the DoD nuclear posture, and the status of the test bans allow.

4. *The Task Force recommends continued funding support for the Dual-Axis Radiographic Hydrodynamic Testing (DARHT) facility; continued near-term support for the Los Alamos Neutron Scattering Experiment/Los Alamos Meson Physics Facility (LANSCE/LAMPF); continued pursuit of advanced computing, including computing through workstation networks; and proceeding with the National Ignition Facility (NIF) as a research facility, balanced with respect to other major investments.*

5. *The Task Force recommends that future production needs should be based on residual capabilities of Pantex, Los Alamos National Laboratory, and Sandia National Laboratories, and believes that no further investments in production capability are needed at this time.*

III. The Energy, Environment, and Related Sciences and Engineering Role

A. Main Findings

This section of the report reviews the laboratories' energy and environmental roles (minus activities associated with clean-up of waste sites, which are dealt with in Section IV), and includes the Task Force's general observations about missions of the laboratories.

1. The Energy Mission of the Laboratories

The national laboratories have an important energy mission which, in the view of the Task Force, remains absolutely vital to the national security and economic welfare of the nation. This mission started with the efforts to create peaceful uses of nuclear energy (a major goal of the civilian Atomic Energy Commission) and assumed new direction and urgency as a result of the energy crises of the 1970s. The 1973 oil embargo prompted Congress the following year to create the Energy Research and Development Administration (ERDA), folding together nuclear programs from the Atomic Energy Commission (AEC), fossil energy and utility distribution programs from the Interior Department, solar and geothermal programs from the National Science Foundation, automotive propulsion programs from the Environmental Protection Agency, as well as several other dispersed functions. Although the Energy Research and Development Administration (ERDA) was to be a transitional agency, replaced by the Cabinet-level Department of Energy in 1977, progress was made in bringing together diverse energy activities previously scattered among many federal agencies. One legacy of the Department's origins, however, is that the different areas of energy supply and end-use R&D remain balkanized--operating as isolated fiefdoms. Additionally, the Department's applied energy programs are not well integrated with either the Department's environmental or basic science programs.

The Task Force believes that one of the most important challenges facing the Department and its laboratories is to achieve greater integration of its various applied and fundamental energy R&D programs (i.e. fossil energy, nuclear fission and fusion, energy efficiency, renewable energy, and basic energy sciences). The integration that is necessary should be both internal, into a portfolio of programmatic activities organized according to a common framework of policy objectives, and external, including both cross-governmental, and Department-private sector initiatives. In the Task Force's view, there is a long list of exciting, challenging, and vital areas of research and technology development that constitute the appropriate energy agenda for the laboratories.

It is important to note that the Department's applied energy programs are executed in a variety of ways, including at the laboratories, both with and without industry cost-shared involvement; directly between the Department and industry, through cost-shared collaborations; and directly with universities. Of the Department's FY 1994 applied energy budget of roughly $1.8 billion, only 30 percent is expended at the laboratories. The Task

Force recognizes that another group of the Secretary of Energy Advisory Board is examining the applied energy programs;[1] however, in the course of our examination we did develop firm views about the energy mission both at the Department and the laboratories.

In general, the Task Force believes that the energy mission is of extreme importance and deserves greater attention by the national laboratories, working in collaboration with the private sector. Additionally, we believe that the Department needs a framework for rationalizing the management of energy supply and conservation technologies in terms of a strategic portfolio of research and development projects.

National and Global Energy Needs

During the next 20 years, world energy demand will grow by 50 percent. Most of this growth will occur in the developing world, where energy is perhaps the single most important factor for economic expansion and enhanced quality of life. Given the environmental impacts of current modes of energy use, research on means of enhancing the efficiency of energy utilization and on substitutes for fossil fuels is of critical national importance. Although oil, natural gas, and coal will remain the dominant energy source in the world for the next 20 years – still providing as much as 80% of the global energy supply in the year 2015 – the development of clean, sustainable, alternative forms of energy will be essential as projected fossil fuel supplies dwindle and environmental constraints mandate a dramatic switch in fuel sources during the next century. The global market for clean energy sources could be in the hundreds of billions of dollars 20 to 30 years from now, yet the R&D involved is of a sufficiently high-risk and long-term nature, and the public purpose of this research is sufficiently compelling, that it properly should be addressed through collaborative work between the public and private sectors.

The Task Force generally believes that the highest priority research areas by the Department and the laboratories are in the areas of energy efficiency, conservation, renewable energy sources (including photovoltaics, biomass, wind, geothermal, and hydrogen), and more efficient recovery of gas and oil resources. The laboratories should also continue to be involved in nuclear fission-related R&D. The Task Force was divided concerning a recommendation for the level of support needed in the area of fusion energy. At a broader level, the Task Force believes that the Department's energy programs should be managed more as a portfolio of investment areas, giving appropriate attention to the diverse and sometimes conflicting goals in various areas of energy supply and conservation R&D. These goals must be balanced with the overall energy objectives of the Department – which must be based on the national goals for energy development and utilization.

These goals must be coordinated closely with the energy supply industry, with makers and users of energy conservation technologies, and with other stakeholders to develop a meaningful strategic plan for investments in energy supply and conservation technologies.

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[1] Strategic Energy Research and Development Task Force, Chaired by Daniel Yergin, President, Cambridge Energy Research Associates.

This is the most important single aspect of the rationalization of the energy R&D work of the Department. A consensus must be developed among potentially competing technologies, users, and stakeholders that defines the R&D needs of the nation in sufficiently explicit terms that conclusions can be drawn to guide the implementation of a rational R&D strategy.

Alliances with the industrial users of the technology will be critical. R&D produces knowledge, but the implementation of that knowledge in plants and products must be done by industry. If industry is not intimately involved in the planning and development of that knowledge, they will be slow to implement it if they do so at all. The Department currently has several major collaborations in place with the Gas Research Institute, Electric Power Research Institute, fossil fuel extraction companies, and energy-intensive industrial sectors, such as the pulp and paper industry. The Task Force commends these efforts, which help guide appropriate areas of government vs. private sector R&D, and help ensure eventual commercialization of new technologies and processes.

The Task Force recognizes, however, that the energy mission of the Department is broader than the interests of the existing private sector in important ways. For example, both energy producing and energy using industrial sectors will have an inevitable bias toward existing technologies and infrastructure, and a relatively short-term outlook. The Department, on the other hand, must consider the long-term energy and economic security of the nation, which are closely linked. Accordingly, the Department must be careful to ensure that, while working closely with energy producers and users, its energy R&D program is not captured or dominated by short-term interests, since the most appropriate areas for laboratory investment using public funds will be in areas which address long-term uncertainties and needs.

Within the portfolio concept, each area of energy technology, and indeed potentially each R&D project, should be evaluated in terms of four key elements:

- Technological strength;
- Technological maturity;
- Competitive impact on public objectives (i.e., energy, efficiency, energy diversity, environmental protection, economic impacts, cost); and,
- Risk.

Section VI of this report provides additional considerations regarding the development of applied energy work at the laboratories.

2. The Environmental Mission of the Laboratories

The DOE laboratories have a diversified environmental mission, which includes two traditional areas of activity and one emerging area. The traditional areas are science and technology development associated with the clean-up of nuclear waste (addressed in Section IV), and R&D related to assessing the environmental impacts of energy use (e.g. global climate modeling, atmospheric chemistry). The emerging area involves systemic approaches to reducing energy and materials consumption in specific industrial applications – such as environmentally-conscious manufacturing – and also for entire segments of the economy.

In Technology for a Sustainable Future[1], the Administration has presented an integrated vision of long-term economic growth that creates jobs and protects the environment. Environmental technologies – ranging from clean energy sources to energy efficient manufacturing techniques to industrial processes that create new products from waste materials to the development and use of new energy efficient materials – are viewed as the means of helping industry shift from waste management to pollution prevention and efficient resource utilization, and a critical step toward implementing industrial ecology. This would enable companies to enhance their competitiveness by lowering energy and resource needs and reducing or eliminating waste disposal costs, and benefit the nation by reducing the environmental impact of economic activity.

The Department of Energy national laboratories should play a significant role – in collaboration with energy- and material-intensive industries – in the development of environmental technologies and an enhanced understanding of resource utilization in the economy. The concept of "industrial ecology" has begun to take root within the private sector as a way to examine energy and materials flows for industrial systems, products, and services, with the objective of providing a systems approach to designing environmental compatibility and sustainability of those systems. The scientific and technological capabilities needed to advance our understanding of energy and material use in the economy, in an industrial ecology framework, include:

- Energy supply, distribution, and end-use science and technology;
- Advanced manufacturing and process technologies;
- Materials science and technology;
- Environmental science and technology; and,
- Modeling and simulation of complex systems.

These capabilities are broadly resident in the Department's national laboratories and are already being applied to a number of projects that hold the potential for substantial improvements in resource utilization by various industrial sectors. For example, in the general area of manufacturing and process technology, projects at the ten laboratories amount to more than $100M/year in FY 1994.

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[1] **Technology for a Sustainable Future, National Science and Technology Council, 1994**

The Task Force believes that the laboratories could, and should, make a significant contribution to the integration of energy, raw materials, technology and environmental science throughout the nation's economy, and the development of the field of industrial ecology. However, at this point neither the Department or the laboratories are organized or managed to support this R&D area. Accordingly, we encourage the Department, working with the laboratories, to develop an integrated plan, based on the portfolio concept, for supporting this important area of research. We encourage the Department, as part of this effort, to establish an Industrial Ecology Advisory Board, including members from the laboratories, state, private industry, public interest groups and other government agencies.

We do not see this as a new mission area for the laboratories, but rather as an extension and integration of existing missions in energy and environmental quality. In fact, the Task Force believes that, without developing additional capabilities in environmental technology and industrial ecology, it will be difficult for the Department to carry out either its energy or its national security mission, such capabilities will augment and add value to the primary missions of the Department and laboratories, rather than being a new mission in itself. In addition, although the Task Force believes that there exists considerable potential within the laboratories to contribute to the development of environmental technology and industrial ecology, we recognize that R&D performers in academia, industry, and other government agencies also have significant roles. The level of support to the laboratories should be determined solely by the quality of performance and the comparative advantage of these institutions in addressing complex technical challenges involving energy and resource utilization.

3. General Observations About Laboratory Missions

Over the past two decades, several studies of the Department of Energy's laboratories have observed that these laboratories do not have clear mission assignments which would enable them to remain tightly focused on specific national priorities and programmatic goals. This Task Force found a continuing lack of mission-derived structure both within the individual national laboratories, and across the system of ten laboratories which were the subject of this review (although the phenomenon is less pronounced at the three weapons laboratories). The multi-program laboratories currently have self-generated mission descriptions which are so broad and generalized that they are essentially indistinguishable. As such, it appears that each laboratory is attempting to keep its options open in all fields of science and technology, which is compounding the problems of effective management. Researchers at the laboratories feel a sense of drift in no small part because the laboratories do not have sufficient focus or clarity of purpose.

The Task Force believes that diffuse mission assignments for the national laboratories may have been politically acceptable and fiscally affordable during the Cold War, but do not meet the political, budgetary, management, and programmatic needs of the present and future. At the same time, the Task Force recognizes that there are important and practical limitations on how narrow one can be in delineating missions for multi-program laboratories which exhibit vast breadth both in technical expertise and programmatic activities, and whose uniqueness in large degree derives from an ability to support complex, multi-disciplinary R&D activities. Such limits also stem from the inherent difficulty of assigning goal-oriented missions to institutions which perform a considerable amount of basic research – activities which the Task Force believes are essential for the nation, but for which the timing and nature of discoveries is fundamentally unknowable.

The Task Force did not elect to take on the task of suggesting specific areas of programmatic focus for each of the national laboratories. However, we do feel strongly that the Department and the laboratories -- working together -- must go much further than they have to-date in developing mission assignments for these laboratories which will balance both the strength of these institutions as multi-program laboratories with the need to provide greater strategic focus within a tight federal budget environment. Such mission descriptions, which should help guide funding decisions by the Department, should:

- Capture the primary focus or strategic thrust of each laboratory, while also identifying the two or three areas of secondary importance based on specialized capabilities;
- Reflect areas of distinctive competence;
- Provide the basis for organizational coherence and motivation; and
- Be sufficiently clear and specific to enable the development of goals against which performance can be evaluated.

The Task Force believes that the development of more refined mission statements for the laboratories, disciplined by Departmental budget decisions and strategic planning, will result – over time – in greater differentiation and specialization among these institutions. One mechanism for institutionalizing this specialization could be, for example, the creation of a number of "Centers of Excellence" within the laboratory system. This will have the beneficial affect of ensuring that the critical mass of programmatic focus in various mission areas will be secured within the confines of individual institutions, rather than being dispersed at sub-threshold levels across the entire system of laboratories. It also will provide the basis for programmatic consolidation and elimination of functional activities which are being performed better elsewhere in society.

The basis for public support of the national laboratories is: 1) that they are locations for centralized, generally large-scale R&D facilities that could not be maintained by academia or the private sector, and 2) they perform R&D for which there is a strong public purpose (e.g. national defense and complex, long-term research), and which for reasons such as market failures or other deficiencies in the national R&D infrastructure, the highest quality performance is through federal funding for these institutions. The basic mission of these laboratories should be to strive for quantum advances in our knowledge base, and to work with other R&D performers to transition such knowledge into applications that meet national needs. One of the great strengths of the multi-program laboratories derives from the diversity of technical expertise that can be brought to bear from within these laboratories on specific scientific and technical challenges. In recommending that more specific missions be assigned to the laboratories, therefore, the Task Force seeks not to force specialization that would fundamentally jeopardize the multi-attribute character of these institutions. Rather, the Task Force is responding to a fundamental fiscal reality that has forced corporations and universities alike to concentrate on areas of strength, and to divest from areas of mediocrity.

While the Task Force believes there is considerable value to ensuring a concentration of capabilities at common locations, we also recognize the value of competition in spurring innovation (i.e. the highest quality proposals, as determined by peer review processes, should be the ones that are funded--regardless of whether proposals to satisfy DOE mission assignments come from a DOE laboratory, university, or industry). However, to-date there seems to have been a pattern of spreading the wealth across the multi-laboratory system rather than concentrating resources at individual laboratories or specific Centers of Excellence.

The Task Force also recognizes that there is considerable potential in achieving greater coordination of R&D expertise across the lab complex. The national laboratories are equipped with the information technologies and the culture of communication via computer networks which could provide the basis for close programmatic integration. The Task Force believes that the goal of efficiency in utilization of the national laboratories mandates that these institutions be managed better as a system, and that complementary strengths be integrated to the extent possible through the establishment of "virtual laboratories" via computer networks and lead laboratory assignments. As the laboratories are given more discrete missions which result in enhanced R&D focus, the creation of "virtual laboratories" will be an important means for retaining complex, multi-disciplinary approaches to problem solving across the laboratory system.

B. Recommendations

1. *The Department should organize itself to achieve greater integration among its applied energy programs, between these programs and industry, and between the applied energy and basic energy research work performed at the laboratories*. The Department's applied energy work does not appear to be managed as a portfolio, rationalized and integrated under a common strategic framework; rather, it operates like disparate fiefdoms. Greater coordination could be achieved through planning efforts that apparently do not now exist.

2. *The integration of energy and environmental considerations should be a fundamental organizing principle for much of the Department's activities*. Energy production and use, environmental protection, and economic output are increasingly interrelated, and the Department--through its laboratories--have substantial technical resources to address these national needs in an integrated fashion. At the present time, however, neither the Department nor its laboratories are organized to meet the potential that the Task Force believes exists to further the development of environmental technologies that meet the shared needs of energy, environment, and the economy. The Department should continue and expand R&D partnership efforts between the laboratories and resource-intensive industries, utilizing the concept of industrial

ecology as a method for deriving outcomes that contribute to sustainable economic development. An Industrial Ecology Advisory Board should be established to support this effort.

3. *The Department and the national laboratories should move promptly to establish clear mission statements for the laboratories which will be utilized as tools for budget decisions and long-term strategic planning*. The process of establishing missions for the laboratories should be exploited as an opportunity to clarify the precise character of the world-class strengths within each of these institutions, as well as the areas which may be appropriate for downsizing, elimination, or consolidation elsewhere within the laboratory system.

4. *Mechanisms should be established to enhance the management of the multi-program laboratories as a system*. The Department should develop a means of breaking the existing pattern of laboratory management, which treats each lab as a conglomerate of hundreds of individual programs, and all of the laboratories as separate and distinct entities. Greater efforts should be taken to coordinate and integrate the complementary strengths of these institutions through communications networks. In addition, institutional arrangements should be established to facilitate joint planning by the full group of multi-program laboratory directors and senior Departmental officials.

5. *The Department should establish lead laboratories according to mission assignments and programmatic strengths*. The current management of programs by the Department from headquarters promotes the existing balkanized structure of program execution. Lead laboratory designations would vest substantial management responsibilities closer to where the work is performed, while leaving Departmental program managers with the job of focusing on research needs, mission success, and long-range strategic policy.

6. *The Department should establish Centers of Excellence within the laboratory system*. These should reflect specific high priority national and Department research needs, and can be either wholly within one laboratory, or a "virtual Center of Excellence," drawing upon the resources of several laboratories. In this way, specialization while retaining broad multidisciplinary capabilities can be encouraged.

IV. The Environmental Cleanup Role

A. Introduction

The Department of Energy's management of its program for dealing with the radioactive and hazardous wastes at its former nuclear weapons production sites and the national laboratories has been criticized for its expense and the slow pace of cleanup. The program is of great size and the problems that plague it, developed over decades, are acute and pervasive. Involving the national laboratories in more sweeping ways is an important part of a number of needed improvements.

B. Background

Disposal practices for radioactive and chemically hazardous wastes from the start of the Manhattan Project of World War II, excepting high level waste, consisted of shallow burial, of injection underground using deep or shallow wells, the use of cribs or settling ponds, or direct release to rivers or streams. Some of the Atomic Energy Commission's (AEC) practices resulted in the exposure of uninformed members of the general public to substantial levels of radiation and in later years there have been well-publicized leaks of toxic and radioactive materials.

Environmental concerns in the U.S. started rising in the 1950s, initiating a new era of citizen participation, and major changes, in environmental matters. Over three dozen pieces of Federal environmental legislation were enacted by the early 1990s. The AEC and later the DOE, did not move as U.S. industry did, maintaining that they were exempted from compliance with the bulk of U.S. environmental legislation.

Although beset by increasing discontent and criticism over its practices, DOE was slow to accommodate. It continued its old patterns of behavior until, in 1984, it lost a key lawsuit brought against it. Amendments to major pieces of Federal environmental legislation now explicitly require DOE compliance. The result has been to make DOE subject to the same array of Federal environmental standards that U.S. industry had already largely adapted to. The DOE found itself 10 years behind in Environmental Protection Agency (EPA) compliance.

In 1989, the Department announced that it would have all of its sites cleaned up by 2019. This same year it created the Office of Environmental Restoration and Waste Management (since renamed the Office of Environmental Management, or EM) to have responsibility for cleanup of the complex. The EM annual budget has risen from $1.6 billion in 1989 to $6.2 billion in 1994 and will exceed $7 billion when the Savannah River Site is transferred to it from Defense Programs. It has become the largest single item in the DOE 's $19 billion budget. It is the largest environmental restoration and waste management program in the world.

Driven by heightened public and Congressional concern, DOE established, in some haste, greatly enhanced requirements governing its own operations. It initiated major growth in the number and scope of environmental, safety and health regulations, nuclear safety regulations and DOE Orders. To ensure compliance, the number of audits, reviews and appraisals was increased dramatically.

DOE now has had to cope with the series of legal commitments to cleanup performance, with milestones and penalties for non-compliance, that it signed with state and federal bodies, for each of its sites. Inadequate attention was given by DOE to the feasibility of these commitments. One example was the Tri-Party Agreement at Hanford, signed by DOE, the EPA and the state of Washington's Department of Public Health. It mandates cleanup of the site by the year 2019.

The Department has been hindered by the press of Federal legislation and regulation by other Federal bodies. A dozen or more pieces of legislation all laid on DOE burdens with which it has been poorly equipped to deal. Moreover by the 1990s, all the states had their own environmental legislation, much of it binding on the Department and not always consistent with its Federal counterpart.

The Department also is hindered by lack of credibility and mistrust, not only on the part of community stakeholders but by Federal and state legislative and regulatory bodies. Some members of these bodies continue to disbelieve the Department, as well as many of its contractors, even when they are telling the truth.

C. Main Findings

1. Technical Challenges

The large quantities of radioactive and hazardous chemical waste that are at the center of concern exist in a broad variety of forms, toxicity, and storage or placement conditions. For the entire 3365 square miles of the DOE complex, now or formerly devoted to weapons-related activities there are, for example:

- 3700 contaminated sites, 500 facilities now surplus, 1000 more which will be declared surplus soon, and 5000 peripheral properties with soil contaminated by uranium mine tailings. DOE might declare as many as 7000 facilities surplus in coming decades, most of which would require cleanup prior to decommissioning.

- More than 330 underground storage tanks (including those at Hanford) containing 77 million gallons of high level radioactive waste as sludges or liquids.

- Waste volumes from weapons-related activities:

    - **High Level Waste (HLW)385,000 cubic meters**
    - Transuranic Waste (TRU)250,000 cubic meters

- Low Level Waste (LLW)2,500,000 cubic meters
- The LLW volume is equivalent to a cube nearly 0.1 mile on an edge which, if water, would weigh 2.8 million tons, if soil, some 8.4 million tons. The costs of disposal of low level radioactive waste (LLW) are currently in the vicinity of $5800 per cubic meter, for HLW as high as $6 million per cubic meter.

- More than one million 55 gallon drums or boxes of stored, hazardous, radioactive, or mixed (radioactive and chemically toxic) waste. An additional 3 million cubic meters of buried waste, much having breached containers, is mixed with soil underground.
- Over 100,000 gallons of plutonium and transuranic waste liquids having a high likelihood of causing environmental contamination and worker safety problems.
- More than 5700 individual "plumes," contaminating soil and groundwater, have been identified on DOE lands. For example, plumes of hazardous chemicals underlie about 150 square miles of the Hanford site.

2. Program Assessment

Two yardsticks are useful in judging the EM program: progress toward cleanup goals and the costs incurred, the latter related to the effectiveness of program management.

The remediation program has accomplished far less than many wish. The Government Accounting Office[1], in a recent review of management changes needed to improve applications of technology in the program, concluded that while "DOE has received about $23 billion for environmental management since 1989, .. little cleanup has resulted. Experts agree that many cleanup technologies in use are extremely costly and offer only short-term solutions." A May 1994 Congressional Budget Office (CBO) Study[2] noted that DOE "has been criticized for inefficiency and inaction in its cleanup efforts. ... [and] has been severely criticized because of the small amount of visible cleanup that has been accomplished." These conclusions are shared by many senior DOE personnel, both within and outside the program.

One of the consequences of the troubles has been the enhancement of a syndrome common to large bureaucracies: risk aversion. It has a name: "the Hanford Syndrome." It has become widespread and severe in the EM program. Its symptoms are an unwillingness to alter familiar behavior patterns, to stick with unproductive or failing procedures, to enhance tendencies for excessive resource allocation and regulation, and to oppose innovation. It is an important element in sustaining unproductive patterns of work.

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[1] "DOE Needs to Expand Use of Cleanup Technologies." GAO/RCED-94 - 9205 .

[2] **"Cleaning Up The Department of Energy's Nuclear Weapons Complex," The Congress of the United States, Congressional Budget Office, Washington, DC. May 1994. This reference contains an extended discussion of DOE 's managerial practices, its approach to risk assessment and to the incorporation of new technologies on remediation efforts.**

The Tri-Party Agreement at Hanford, and similar ones elsewhere, have proven to constitute major constraints on remediation progress because, in many instances, they are unrealistic, not having had proper input from those experienced in actual cleanup. The milestones they incorporate, along with penalties for noncompliance, force continued activities, some of which are make-work and should be abandoned. Other activities should be delayed or modified so as to await more effective and less costly technologies. Virtually no one believes the timetables are achievable and DOE has already been forced into renegotiations, as at Hanford in January 1994. Elsewhere DOE has been paying fines, owing to the Department's incapacity to meet deadlines, as at Rocky Flats where $27 million is now due for missing cleanup deadlines.

Probably the most important reason behind the slow pace of assessment and cleanup is the low quality of science and technology that is being applied in the field. Many of the methods, such as "pump and treat" for contaminated ground water remediation, cannot provide the claimed benefits. There is a lack of realization that many – and some experts believe most – existing remediation approaches are doomed to technical failure. Others would require unacceptable expenditures and much extended time to reach their stated objectives.

Over time, an increasing proportion of DOE resources has been going into DOE management in an attempt to lower environmental costs. The Congressional Budget Office report concluded that "at least 40% of the cleanup program's funds are devoted to administrative and support activities, a level that many reviewers have considered excessive. ...[they] represent a proportion that is significantly higher than the share spent by some other government agencies that may be performing similar tasks."[1]

DOE provides the most expensive environmental services of any government agency, with costs 40% above the average in the private sector. When DOE first became aware of these high costs, the Department's response was to try to lower them by an increase in management attention: it added between 1200 and 1600 Full Time Equivalents to its management and oversight personnel overseeing the remediation program.

How much the program will cost when and if completed cannot now be assessed with confidence. Estimates in the range $300 billion to $1 trillion have been made by DOE officials, but a lack of specific goals and achievable schedules as well as the absence of some critical remediation technologies make fixing the sum difficult. Some part of the facilities' contamination cannot be wholly cleaned-up; portions of the Hanford site, as well as others, will still be radioactive after many thousands of years.

D. Disconnects

One useful way of understanding the nature of the problems plaguing the DOE program is to look at "disconnects," potentially discordant sets of activities whose discord the

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[1] Ibid

Department has been incapable of harmonizing. There are disconnects in three areas of major importance to the EM program: (1) science/engineering and applications, (2) regulatory, oversight and compliance and (3) goals, objectives and means, the last involving the stakeholders affected by the program. These persistent disconnects have had numerous adverse consequences on the program.

1. Science/Engineering - Applications

There is a marked incapacity within the Department's EM program to evaluate current and prospective technologies in a wide-ranging and competent manner based on well-assessed risks. Without the resulting information it is not possible to introduce improved technologies into the applications stream or to modify or eliminate inefficient or ineffective ones. The gap between what might be applied and what is applied is well known within the program; it is called the "Valley of Death." In part it reflects the fact that there is inadequate communication between those attempting to remediate the contaminated sites and the research community that holds the key to identifying and readying advanced and powerful technologies.

One of the injurious consequences of the gap has been the failure to carry out a full program to characterize the waste remediation challenge across the many DOE sites: the nature of the risks presented by the diverse array of problem radioactivity and hazardous materials, the identification of applicable and available technologies to deal with them, as well as their limitations, and provide schedules, costs and expected effectiveness of reasonable and acceptable programs of remediation. The laboratories have not been tasked to perform such a characterization although they are well aware of its lack and have the technical capacity to carry it out.

The new-technology chain is seriously broken within DOE. There is little basic research being carried out relevant to the problems at hand and there is little rigorous analysis to learn from the experience in the field or from current tests. There is, for example, breakdown in communication and cooperation between organizational units within EM, from headquarters to field offices to sites. Technologies are being developed independent of field and site needs that are subsequently not field implemented because of a lack of customer interest or involvement or because they replicate work done elsewhere.

The root deficiency, which makes the science/engineering - applications disconnect a persistent problem, is the absence of a sustained, high-quality, scientific/technical review capability at a high level within DOE as well as a lack of leadership and poor management of the science/engineering - operational interface.

2. Regulatory - Oversight - Compliance: Management Disconnects

The host of self-inflicted, complex and frequently contradictory or redundant regulations and requirements that the laboratories and remediation efforts are subject to has become an enormous obstacle. Compliance can be quite burdensome, expensive and frequently fails to improve the affected activities. The influence of this disconnect is not confined to the EM program alone. It affects most every DOE activity, including those in both the multiprogram and the program-dedicated laboratories. Its consequences are greatest in the EM program simply because this program is DOE's largest.

In many circumstances there are harsh non-compliance provisions, and legal personal and civil penalties for failure. People are intimidated, afraid of going to jail, and this forces an excess conservatism, sometimes bordering on inaction. There is no dispute that this aggravates inherent tendencies toward risk aversion, a problem for other reasons, as noted earlier.

The managerial defects are discussed in the Appendix and are the subject of Section VII. That section should be considered an important adjunct to this present contribution for these defects have played an important role in causing and sustaining the problems in the EM program.

3. Goals - Objectives - Means: Stakeholders Interests

DOE has not set out to determine, in concert with affected stakeholders, the goals it should pursue, nor the standards to be met in the EM program. There is a disconnect with the customer base. Are waste-contaminated soils to be removed, remediated, left in place? What exactly is to be done to and with low-level waste? What to do about the large quantity of tritiated groundwater? What site conditions are the activities at Rocky Flats intended to achieve? No one is entirely sure. The January 1994 alterations to the Hanford Tri-Party Agreement were, in part, a consequence of some of these issues surfacing.

One result of the disconnect is too much attention to the immediate, acute problems, such as possible tank leaks, explosions, overheating, with relative neglect of longer range difficulties. The immediate matters can be serious, and must be dealt with, but the lack of a systems approach to the problems and their solutions, and thus lack of a synoptic view, means a poor priority list and provides bad choices. All of these elements lead to much ineffectual, albeit expensive activities.[1]

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[1] For example, after the forced shutdown of Rocky Flats, in the fall of 1989, acidic plutonium solutions were left in a half dozen tanks in one building, with concentrations up to 125 grams of plutonium per liter. They remain there to this day, with seals and gaskets deteriorating and occasional leaks occurring. It would have required 2 weeks to one month to process and eliminate the immediate risk. There is 70 miles of piping containing Pu-nitric acid solution with 30 kg of Pu in them.

E. The Future

1. Within DOE

A well-functioning EM program with clearly defined goals is surely within reach, given a Department commitment to move forward. The model that many refer to was the hugely successful Manhattan Project of World War II, with its exquisite blend of basic and applied science underlying a large production complex, based on previously unknown physical phenomena. From it emerged the testing, production and delivery of the weapons employed just at the end of the conflict. The scientific challenge today is less profound, the managerial ones more so. A crisp, well-defined program, fully utilizing national laboratory skills, could prove a model within the Department and for the nation on how to run a major enterprise. We now have a poignant situation, for technology known to senior scientists and engineers both in the national laboratories and in the country's universities is in the wings that, appropriately applied, could dramatically alter the current prospects.

2. The National Laboratories

Because the EM program so badly needs high quality science and engineering development, the national laboratories together have a critical role to play, a role very much larger than at present. The laboratories have unique resources and facilities and are accustomed to the complex, interdisciplinary blend of sciences and technologies that are the mark of large, technically-driven enterprises. They are really the only organizations that can pursue the large-scale basic research and development so badly needed to replace those conventional approaches that blight much of the current EM program. Industrial site-contractors cannot carry out such tasks effectively for much commitment to basic research puts the meeting of compliance deadlines at risk, dangerous in today's climate.

Most of the national laboratories confront large ranges of environmental problems on their own sites which, while regrettable, can serve as test beds for the development of a broad spectrum of improved remediation, waste minimization and cleanup technologies for application on far larger scales.

It may be important to designate lead laboratories for major programs to be established from among the laboratories to provide the synoptic view necessary to implementation of the scientific and technical studies and demonstrations necessary for a swift and efficient program. Most all of the national laboratories have important contributions to make to the EM program; a lead laboratory's role would be one of coordination and overall systems analysis and integration for a particular major effort. This does not mean assuming management responsibilities. The responsibilities fall to DOE management and its contractors and should remain there.

An additional benefit from designation of such lead laboratories is that they could become test beds for improvements in DOE regulatory and management practices and DOE Order compliance as well as for enhanced public participation. In brief, they can act as sites for valuable pilot programs, demonstrating the benefits of positive changes.

Formal institutional connections will be required with a number of other Federal bodies whose skills or whose regulatory authority relate to the tasks of the remediation program. These include the Environmental Protection Agency, the Department of Defense, the Bureau of Mines, and others. A lead laboratory is the natural place for much of this linkage to be coordinated. Here is where special regulatory provisions must be hammered out so as not to hobble research and development work unnecessarily. Constraints on environmentally injurious activities necessary to "production" cleanup and remediation efforts are not always appropriate to research, where special relief is often required and typically difficult or impossible to get.

The recommendation to create lead laboratories could well arise naturally, in the wake of other beneficial changes, but it might be well to anticipate its arrival. The first task of one lead laboratory would be to organize the long-missing characterization of the remediation challenge mentioned earlier. This must be carried out with stakeholder participation for reasons discussed above. It would be a major program as it would require the participation of many of the Department's laboratories and EM sites . Thoughtful options would then soon appear.

There are difficulties to organizing laboratory participation. One is the need to insure neutrality or to have a sure mechanism for dealing with real or perceived drift from neutrality. A second is the absolute need for strong leadership of the whole EM program. The lead laboratory cannot provide this leadership; it must come from above. Fortunately resolving the second difficulty would go a long way to resolving the first.

3. The Nation

One consequence of the activities of the United States' environmental movement is the massive environmental cleanup underway at numerous designated cleanup sites as well as at many other places in the nation. There are 60,000 EPA Superfund sites, 2400 Resource Conservation and Recovery Act (RCRA) sites, 22,00 state-funded sites, and 7200 DoD sites. The total U.S. cleanup bill is estimated to be about $1.7 Trillion dollars. The program is going slowly. "Of the $15 Billion that has already been spent on Superfund cleanups (across the nation), roughly 75% has gone to legal fees and related costs."[1] The need for more cost effective cleanup has already become an urgent matter.

Many of the problems are very similar to those that DOE faces. In particular DOD, EPA and others are struggling with the same technology and management issues as DOE. They will badly need the technical skills that a well-organized, technically competent DOE effort, with national laboratory help, could provide. For example, volatile organic compounds in arid and non-arid soils and ground water is one of the most common environmental problems in the US. Lawrence Livermore has already made important contributions to the technology of dealing with them.

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[1] **Business Week, Aug. 2, 1993.**

There is abundant evidence for the beneficial role the national laboratories could play in helping resolve national problems in the numerous advances that they have already made. Ocean-climate interactions are being modeled by Los Alamos in support of Global Climatic Change studies with similar global and regional atmospheric modeling at Lawrence Livermore National Laboratory. Many of the laboratories have made contributions in the areas of environmental damage and resource base assessment and diagnostics.

The Department must take positive steps to encourage this attractive opportunity. It will, among others actions, have to consider reducing its cost-recovery fees levied on all "Work for Others." These fees now signal that contributions to the tasks faced by other agencies of government are not a high priority with the Department. The national laboratories could look forward to being available to the entire government system as a powerful environmental technical resource, a great national need. They should become in fact, as well as in name, national laboratories, saving our nation significant resources and improving cleanup efficiency. If the national laboratories do not fill this role, there will be no satisfactory alternative, and the need will remain substantially unmet. In any event the experience base and the technological developments arising from the continuing EM program from the laboratories', industry's and research universities' contributions should be shared with the country on a continuing basis.

A broader vision sees the U.S. environmental and resource problems as a subset of many similar ones throughout the world. Science and technology must play a key role in coping with them. A strong DOE program could contribute at all levels. We are the nation best equipped to contribute solutions. Within the US, the Department of Energy marshals the best of these skills through its national laboratories and they could be put at the world's service.

F. Concluding Remarks

The Atomic Energy Commission, and for many years the Department of Energy, broke the unwritten contract between these arms of government and the people they were to serve. The results, contamination on an enormous scale and a bitter distrust, imply a deep obligation to carry through the cleanup that has now been launched, with efficiency, speed, and a decent respect for the opinions and needs of those affected. This cannot be accomplished as things are now. The changes required are clear; marshal the skills high in the DOE to bring about the managerial changes that are required; raise the quality of science and engineering in the program, among others things by utilizing adequately the great power available in the national laboratories as well as the power among DOE contractors and in the universities. The changes only need to be set in place and exploited.

G. Recommendations

1. *Sustained improvements in DOE management and leadership are needed both at senior levels in the Department and in positions below the Deputy Assistant Secretary level.* It is clear from the above material that those portions of the problems that DOE can control stem from managerial deficiencies at the top levels in the Department.

2. *A comprehensive remedy to the array of problems plaguing the EM program can only be achieved by a substantial commitment and high priority to address the challenges of this program*. These must originate high in the Department. It seems clear that this must occur at the Under Secretary level. This does not imply disassembling the present EM structure under an Assistant Secretary. It does mean a technically adept, flexible and perceptive management of that and related efforts within DOE that acts with power.

3. *Closing the science/engineering - applications disconnect should be dealt with by the establishment of an "Environmental Advisory Board (EAB)," reporting to the Under Secretary*. This should be a permanent Board and should include mostly scientists and engineers from within and without the Department and the laboratories, as well as stakeholders, to ease public acceptance of its recommendations. A good review capability could be provided by the EAB to identify needs so as to stimulate, with Department support, the required basic research, development and demonstrations. Such advances which should then be applied, by capable management, to improve field remediation activities. The Board must have influence and visibility in order to fulfill its role as an instrument of the Under Secretary. The High Energy Physics Advisory Panel (HEPAP) and the Nuclear Science Advisory Committee (NSAC) have such visibility, enhanced by their ability to give testimony to the Congress and their access to the Office of Science and Technology Policy. They are both widely believed to be quite successful. With members having a spread of skills, the Board should be able to provide technical oversight, flag management and regulatory disconnects as they arise and provide the synoptic view of the array of problems now lacking.

4. *The national laboratories together have a critical role to play, a role very much larger than at present, in performing high-quality science and engineering for the Environmental Management program*. Their principal contributions would be:

   - Help to characterize the waste remediation across the DOE complex as a first step in helping the Department establish priorities for environmental work.

   - Help communicate the technical challenges to the appropriate research communities.

   - Help close the "Valley of Death," by aiding the construction of a seamless technology development chain.

   The level of support necessary to implement major laboratory involvement as recommended here is small compared to the sums currently expended in the program. As an example, an increment of $400 million annually for the laboratories with a ramp-up over time to twice that sum is roughly the scale needed to pursue research and development in an improved program. In view of the large fraction of the nearly $7 billion annual EM budget that clearly is misspent now, we see no serious difficulty in redirecting funds that are already flowing. No supplemental money should be required.

5. *The Department must take positive steps to make the national laboratories available to the entire government system as a powerful environmental technical resource*. They should become in fact, as well as in name, national laboratories. The Department must take positive steps to encourage this attractive opportunity. It will, among others actions, have to drop, or greatly lower, its cost-recovery fees levied on "Work for Others."

6. *DOE must address more forcefully the task of renegotiating the unrealistic or unfeasible elements of the cleanup compliance agreements that it has made with State and Federal agencies*. These are now impediments from risk management, technical feasibility, and public perception standpoints as well as forcing large and fruitless expenditures. The Federal government's Superfund legislation also incorporates unrealistic goals; legislation in 1993, which failed to pass, addressed many of the issues which make many current remediation schemes impractical and expensive. The new Congress, as well as DOE, should revisit the issue, benefiting DOE's remediation efforts and other cleanup under Superfund.

7. *Much more comprehensive involvement by members of the affected public in decision making should be employed to reduce the bitterness, distrust and distress that continue to provide a troublesome element in DOE's conduct of its affairs*.

8. *The bulk of the EM environmental challenges, although presenting no immediate threats to public health or safety, still should be addressed with a heightened sense of urgency*. They have already been changing from acute to chronic problems, are becoming calcified, and the vast flow of funds into the program acts as an anesthetic, numbing the Department, State regulatory agencies and affected stakeholders, hindering and delaying beneficial change.

V. The Science-Engineering Role

A. Main Findings

The intense economic pressures now being experienced throughout the nation's research and development system will likely persist for the foreseeable future. This means that the nation must establish what is critical to be done and make sure that it is adequately funded. It also means that institutional effectiveness, including cost effectiveness, must be a paramount goal of national research and development policies. A prerequisite for achieving this is that there be a clear understanding of the relative strengths and distinct roles of the national laboratories, the research universities, and the industrial research laboratories so that an efficient division of labor can be made among them. We will comment on this in the context of industrial technology development in Section VI. Here we focus on DOE-sponsored fundamental research in science and engineering.

The Department of Energy is one of the principal Federal sponsors of basic research in the physical sciences. The Department has the responsibility to support fundamental science and engineering in areas relevant to its broad missions in national security, energy, and environment. Exercise of this responsibility requires a long-term and broad view of the areas of science that should be developed, as well as support for the education of the future scientific and engineering workforce of the United States in these fields. Historically, the DOE and its predecessor agencies have provided important financial resources for science and engineering education. They have also supported, as a national trust, certain areas of science involving the development, design and operation of large, complex user research facilities run for the benefit of the science community at large. These scientific, technological and educational activities have contributed both essential human resources and technologies to DOE's national security, environmental protection, and energy technology missions, and have also served the national interest in other domains.

DOE's spending on basic research is heavily weighted towards its own contractor-operated laboratories – including those considered in this study. These laboratories perform 67% of DOE-sponsored basic research, while the universities carry out 20%.[1,2]

For the laboratories reviewed here, basic research accounts for varying fractions of the overall research and development effort, ranging from 56% at Brookhaven National

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[1] National Science Board, Science and Engineering Indicators - 1993, Appendix 4-11, p. 346. The data referenced here are obtained from NSF-conducted surveys and should be interpreted with caution since DOE does not budget its research according to the categories used in the surveys. In reality, it is sometimes difficult to make the distinction between basic and applied research in those laboratories where the work is mainly applied R&D.

[2] The same preference for the laboratories is true of the DOE R&D budget as a whole. The majority (62%) of all DOE-sponsored research and development is done in the DOE laboratories, with most of the rest being done at the universities (9%), federal laboratories (8%) and industry (18%).

Laboratory to only 7% at Sandia National Laboratory. Overall, the laboratories devote about 19% of their combined R&D budget to basic research.[1]

Most laboratory directors believe that basic research is an essential part of their portfolio of activities. We agree with their arguments that basic research is necessary to support their core missions, that it is necessary to attract the most talented people to the laboratories, and that a strong in-house community of experimental and theoretical researchers is necessary to keep major experimental facilities healthy and organic. (As a rule of thumb, one laboratory director estimates that an internal community of first-rate experimentalists capable of successfully competing for 10-20% of the available machine time is necessary for this last function.)

Basic research at the DOE laboratories is under increasing pressure. In part this is the result of the same forces that are being brought to bear throughout the nation's R&D system. But there are several additional factors that are specific to the DOE laboratories: (1) a decline in the status of basic science within DOE; (2) an increasing trend towards micro-management of research by DOE program officers; (3) the potential diversion of funds away from basic research towards the new technology transfer activities; (4) the decline in defense R&D funds, which historically have been the traditional source of support for much of the basic science at the weapons laboratories; (5) inadequate up-front budgetary allowances for operation and maintenance of large user facilities; and (6) increasingly burdensome compliance requirements, especially at large scientific facilities, which are driving up laboratory operating budgets and reducing the amount of funding available for research.

The Task Force is concerned about what appears to have been a significant decline in DOE funding for fundamental research over the past three years, with the prospect of still deeper cuts to follow. The Task Force further notes that while these reductions have been occurring, overall support for basic research in the federal government as a whole has remained roughly constant or even increased somewhat.

The Task Force is also concerned that the distribution of DOE's basic research effort has failed to keep pace with recent changes in its mission. The Department is aware of the problem, and has instituted steps to address it. However, bureaucratic walls between program offices which contribute to the problem persist. As indicated in Section IV, there is a particular need for long-term, basic research in disciplines related to environmental cleanup. The activity that does exist in this area is poorly integrated into the cleanup program. By focusing too heavily on near-term demonstrations of cleanup technology, DOE is not using its laboratory capabilities effectively. The cleanup of DOE sites will not be accomplished in the near-term in any case, and in most situations there is no proximate danger to human life. Adopting a science-based approach that includes supporting development of technologies and expertise in universities as well as the laboratories could lead both to reduced cleanup costs and smaller environmental impacts at existing sites and to the development of a scientific foundation for advances in environmental technologies (see Section IV).

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[1] These data were obtained from the responses of nine laboratories to a survey questionnaire prepared on the Panel's behalf. (INEL did not respond to the survey but does very little basic research.) The survey used the same definition of 'basic research' that is used by the National Science Foundation: "The objective of basic research is to gain more complete understanding of the subject under study, without specific applications in mind. In industry, basic research is defined as research that advances scientific knowledge but does not have specific immediate objectives, although it may be in fields of present or potential commercial interest." An independent GAO survey of ten DOE laboratories found that 16% of their total R&D fell in the basic research category. The laboratories' responses to the Panel's and GAO's surveys indicate that they may see their R&D activity as more applied in nature than do the DOE respondents to the NSF survey referred to in a previous note. [Editor's note: A typographical error in the first printing reported the proportion of basic research at Sandia National Laboratories as only 0.7%]

Compared with the universities, the main strength of the DOE laboratories in basic research has generally been in building and overseeing the operation of large-scale, complex scientific facilities (light sources, neutron sources, accelerators, reactors, etc.). However, it should also be noted that not all facilities of this type have been located at the multiprogram laboratories, and that some, including some very large ones, have instead been placed at program-dedicated laboratories such as the Fermi National Accelerator Laboratory (FNAL), Stanford Linear Accelerator Center (SLAC), and the Princeton Plasma Physics Laboratory (PPPL).

The laboratories are also capable of forming large, interdisciplinary research teams needed for certain types of 'big science' problems even where large facilities are not involved. Universities are not generally as well equipped to assemble teams to conduct closely coordinated, multidisciplinary research over an extended period.

Compared with the government laboratories, the main advantages of conducting basic research at the universities lie in: (1) their primary role in educating the next generation of scientists and engineers; (2) the rejuvenating effects of the constant flow of students and post-docs through university labs; (3) the absence of national-security-related barriers to the flow of knowledge, (4) the lower price charged by the universities to sponsors for comparable research in many cases; and (5) the quality benefits provided by the systematic application of the principle of merit-based competition. Merit review is applied to basic research at the laboratories in a variety of ways, and sometimes unevenly.

The advantages enjoyed by the universities are most pronounced in 'small science.' However, the DOE Office of Basic Energy Sciences also supports some individual investigator research within the laboratories on a competitive basis. To varying degrees the laboratories themselves also support such research out of their operating budgets. This type of small science research at the national laboratories is generally of a high standard, and in some cases matches the best university work in the field. On the other hand, the research culture at many of the laboratories has been influenced by their relative physical and intellectual isolation and by a sense of entitlement to research funds, and this has contributed to a loss of vitality in some research areas.[1]

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[1] The panel attempted to determine in what proportions the different kinds of basic research described in the preceding paragraphs occur at the laboratories. According to the results of the survey carried out by the panel, basic research that is related to large user facilities accounts for 55% of all basic research at the laboratories; basic research that involves large interdisciplinary teams but that is unrelated to large user facilities accounts for another 34%; and general/single investigator basic research of the type most similar to university research accounts for the remaining 11%.

The third major category of basic research institutions, corporate scientific research laboratories, are being downsized, redirected towards activities with shorter-term commercial payoff, and in some cases dismantled altogether. Historically, research at these industrial laboratories has had a different character from either university or national laboratory research. While long-term and often fundamental in nature, it has also been shaped by knowledge of markets and motivated by expectations of commercial opportunity. And as two of our colleagues have pointed out elsewhere, 'the best of the industrial laboratories achieved a high degree of coherence of purpose and of organizational cohesion, which enhanced their productivity. And the larger enterprises could operate on a scale sufficient to employ experts across a broad range of relevant topics, facilitating work on many fronts."[1]

The nation presently faces the challenge of finding an institutional substitute for the corporate central research laboratories. However, we do not think that the national laboratories provide a good institutional basis for a general solution. Partly the problem is the one discussed in more detail in Section VI. If an organization is to serve as an effective laboratory for an industry, that industry must have a large say in allocation decisions and in evaluation. This would be awkward at best, and probably politically unviable, in a government-owned laboratory. But in addition, for a laboratory to perform the central research function effectively a considerable flow of personnel between the laboratory and the industry is required. University-affiliated facilities seem better adapted to meet portions of this need than government laboratories. In some cases, DOE laboratories may effectively be able to perform a function analogous to corporate central research. But these are most likely to be in areas where a DOE mission -- like advancing superconductivity technology -- and industry interests have a strong overlap.

B. Recommendations

1. *The Department of Energy should move to strengthen its efforts in fundamental science and engineering, both at the laboratories and in the universities.* The DOE has vital stewardship responsibilities in a range of basic science fields, especially in some areas of the physical sciences. Moreover, a strong foundation of science and engineering should underpin all of DOE's programmatic missions. The DOE should clearly define its basic science responsibilities, pursue them in a focused way, and ensure that adequate resources are available to do this.

2. *The DOE should pay close attention to ensuring that a proper balance is maintained between the universities and the national laboratories in the performance of DOE-related basic research, both now and in the future.* The laboratories are now and should remain an important part of the nation's research infrastructure, providing cutting-edge scientific instrumentation and operating world-class research facilities. But in the future the Department will need to ensure that the basic research and

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[1] **Richard Nelson, Richard Rosenbloom, and William Spencer, "Shaping a New Era", November 1994 (DRAFT)**

associated educational programs of the universities are not jeopardized by an exaggerated flow of federal basic research funds to the laboratories.

3. *Support for operating and maintaining large facilities in the DOE's Office of Energy Research should be budgeted separately from funds for specific programs*. This will provide better accountability and budgetary control, and will impose greater discipline on decisions requiring trade-offs to be made between investing in new facilities and keeping existing ones in service.

4. *The DOE should redouble its efforts to achieve better integration of basic research, technology development programs, and their applications, particularly in the area of environmental remediation*.

5. *Basic research at the laboratories should be more fully integrated into the national and international research community*. With the exception of national security-related work, all basic research at the laboratories should be subject to external merit review. Barriers that currently prevent laboratory personnel from traveling, participating in national and international conferences, and spending sabbaticals in industry or the universities should be eliminated. Further, to help promote the vitality of basic research at the laboratories, we recommend that DOE set aside small pools of basic research funds in the different programmatic areas for which university and laboratory researchers would compete.

6. *There should be additional stimulation of laboratory-university cooperation in basic research*. This can be achieved through measures such as having the laboratories support more graduate students, especially in mission-enhancing disciplines; creating more post-doctoral positions at the laboratories; arranging for university appointments for laboratory scientists and engineers; and setting aside funds to be used specifically for collaborative research between the universities and the laboratories. Barriers that make it difficult for the laboratories to jointly fund research at universities with other funding sources should be removed. Also, laboratory efforts to promote scientific education at all levels (kindergarten through graduate school) will benefit from being more closely coordinated with parallel efforts by colleges and universities.

VI. The Economic Role

A. Main Findings

The Task Force learned of significant examples of laboratory-developed technology being usefully transferred into industry and of the laboratories providing useful technical services to industry. However, the laboratories are not now, nor will they become, cornucopias of relevant technology for a broad range of industries. A significant fraction of the laboratories' industrial competitiveness activities concern technologies which are of less than primary importance to their industrial collaborators and/or which these partners could obtain from other sources. There are only a relatively few instances in which the laboratories have technology that is vital to industry and that is uniquely available at the laboratories. Many firms also find it attractive to collaborate with the laboratories because of the availability of Federal cost-sharing funds. In practice the government subsidy is often very substantial relative to the new resource commitments that the firms are making to these projects.

Taken as a whole, the industrial competitiveness activities at the national laboratories are unfocused and lack a firm policy foundation. There is uncertainty within the laboratories about how large and broad-ranging these activities ought to be, about how to fund them, and about how they should relate to the other main areas of activity that the laboratories are engaged in – in particular, whether industrial competitiveness should be viewed as a primary or a derivative function. The uncertainty within the laboratories partly reflects an inconstancy in DOE policy and Congressional intent regarding these issues. One of the options that the Department has considered, elevating industrial competitiveness to a primary objective or mission, risks distorting existing programs and diverting resources towards activities that are unrelated to either DOE's competencies or its other missions. Such activities are unlikely to produce results that will benefit either the agency's industrial partners or the public in the long run. Recent indications are that DOE headquarters staff have recognized the need for greater focus in this area and are moving to develop criteria toward that end. We welcome these developments and encourage early discussions of the evolving situation with laboratory leadership.

Another issue requiring clarification concerns the appropriate division of labor among the national laboratories, industrial research laboratories, and the research universities regarding industrial R&D. The notion that the national laboratories should serve as a "bridge" between the research universities and industry in this arena – a notion presented to the Task Force – is not in general a useful way to think about this division of labor. It does not reflect what is currently happening, it is not consistent with the fact of the research universities' superior record relative to the laboratories as agents of technology transfer, it is difficult to reconcile with any plausible view of the future evolution of these institutions, and it appears to be based on an outdated picture of industrial innovation as a linear process that originates in basic research laboratories.

A more useful picture is of the laboratories serving as nodes in a national network of research and development institutions, with knowledge flowing in both directions along the links between the laboratory, university, and firm nodes. This network is simultaneously pursuing fundamental knowledge for its own sake, innovation for the purposes of private wealth creation, and public missions (national defense, public health, environmental quality, etc.), while at the same time educating and training the next generation of scientists and engineers. Because it is a true network, each type of R&D institution is involved in some way in all of the network's activities, but there is specialization among them. While the national laboratories are one of the primary nodes for public missions like national security, their role in wealth-creating innovation is necessarily secondary (and probably even tertiary in sectors far removed from the DOE's mission areas). The question is whether, how, and to what extent they can add value to the primary role of industry in this arena.

1. The Case For Industrially-Relevant R&D At The Laboratories

There are two principal reasons why industrially-relevant R&D is seen as an appropriate activity for the DOE laboratories. First, long-term research and development in industrial laboratories is declining, and industry is seeking substitutes for the functions that these laboratories once performed. Second, there is a perception that the U.S. government is spending significant resources on the development of new technologies but that American industry is not reaping the rewards of that investment. In the course of pursuing the DOE missions, the laboratories have developed an impressive array of core competencies, capabilities, and facilities, and to many it seems only logical that these resources be used to benefit the public in other ways.

2. A Critical Distinction

However, what seems to have been lacking at both the DOE and laboratory levels is a clear understanding of the distinction between the application of laboratory-developed technologies to industries where such application is an essential part of the primary mission areas of DOE (e.g., the development of energy saving technology for industry use, or the development of methods for analyzing and predicting the behavior of nuclear waste repositories, or the development of advanced techniques for oil field simulation) and, on the other hand, the application of these technologies to industries which have not had a relationship with DOE and whose activities lie well outside the mission domains of the agency and its laboratories. Without a clear understanding of this important distinction, the risk is that DOE will allocate public funds and the technical and human resources embodied in the laboratories in unfruitful ways.

To clarify and sharpen this distinction, we have found it useful to categorize the range of possible laboratory activities in industrially-relevant R&D according to their position in the simple matrix shown in Figure 2. In practice the boundaries between the classes of activity shown in Figure 2 are imprecise, but the basic distinctions are important nonetheless. The four categories are as follows:

Near-term R&D applied to industries outside traditional DOE mission areas (i.e., national security, energy, environmental remediation). To be effective, near-term R&D work must take place in an environment rich in interactions with users and customers. Market-based influence, direction, and control are critical to success. In recognition of this, firms themselves have been evolving towards a more integrated process for developing new technologies, in which all participating Departments and disciplines are drawn into close and continuing interaction with the marketplace. The more distant the laboratories are from the marketplace, the more remote the likelihood that they will have something useful to contribute to such activities. Near-term development work at the laboratories is least likely to provide substantial contributions to industries outside of DOE's traditional domains of national security, energy, and certain aspects of the environment.

	Within Traditional DOE Mission Areas*	**Outside Traditional DOE Mission Areas***
Near-Term Development	**Less Likely**	**Least Likely**
Longer-Term Research and Development	**More Likely**	**Less Likely**

National Security, Energy, and Environment

Figure 2 Expected DOE National Laboratory Contributions to Industrial Research and Development

- Longer-term R&D applied to industries outside traditional DOE mission areas. The potential contribution of longer-term laboratory research and development to commercial applications outside the DOE mission areas should similarly not be exaggerated. While there are instances of successful 'by-product' R&D, the historical evidence demonstrates that such events are statistically improbable. Even for longer-term development activity, strong interactions with the marketplace are usually essential to success. To provide industry benefits, such long-term R&D would need to be tied closely to groups of industries that have never had close association with the laboratories, their people, or their culture, an unlikely prospect for creating useful results. Moreover, to be useful in a different industrial context, substantial technological modifications are almost always necessary, so if the laboratories are engaged in such activity resources will inevitably be diverted from their primary missions.

- Longer-term R&D applied within traditional DOE mission domains. For firms and industries that are contributing to DOE's traditional mission objectives, the national laboratories have a useful role in carrying out long-term research and development with potential commercial applications. Indeed, it is even possible to imagine the laboratories playing a role with respect to these industries comparable to that which used to be played by central corporate research laboratories. Here the alignment between DOE and industry objectives is much closer by definition, and both DOE and its laboratories have more knowledge of their industrial partners' market environment. Longer-term research and development of this kind undertaken by the laboratories does not require day-to-day direction by industry, but close interactions are still important.

- Near-term development applied to traditional DOE mission domains. Firms and industries that are participating with DOE in pursuit of its traditional missions of national security/energy/environmental pollution control and remediation may become aware of technical developments at the laboratories that will help them in solving a short-term product or process development problem. In such cases industry should be an active partner in directing the course of development, and should be encouraged to transfer interim laboratory outcomes into its own internal industrial R&D programs through the appropriate licensing mechanisms.

3. Expansion Outside DOE Mission Areas

We are concerned about the implications of expanding the laboratories' industrial R&D activities outside the existing DOE mission areas. If the DOE is to get into programs whose primary mission is to meet a need of private industry (as contrasted with programs where private industry needs are complementary to government needs, but not dominant), private industry will need to have a large say in allocation decisions and in evaluation, since only industry has the intimate knowledge of the marketplace that is critical to the success of such efforts. The difficulty comes in reconciling this need for industry direction with the parallel need for public influence over the disposition of public resources at government laboratories.

We are also concerned that the expansion of the laboratories' roles in serving the technology needs of private enterprise will create additional managerial problems within DOE. For any organization to be effective, the activities it manages need to be associated with a coherent set of objectives. Otherwise, it is virtually impossible to allocate resources rationally, or to evaluate the various activities and programs in terms of how they contribute to the performance of the organization as a whole. This is amply borne out by experience in private enterprise which indicates that most conglomerates do badly, especially in managing technological innovation. Under statute, the DOE is faced with the considerable challenge of managing an already diverse set of missions. Adding to this complex task the requirement to consider the technology needs of the private sector in areas not related to the Department's traditional domain of activity is likely to distract DOE from its public missions and lessen its impact while undermining the effective pursuit of those industrial objectives. We are concerned that 'porkbarrel' criteria for program funding might increasingly replace more rational resource allocation, and that the laboratories might be more likely to propose industrial programs merely based on 'make work' criteria.

We are further concerned about the possibility that DOE and its laboratories, in engaging in industrial R&D, may find themselves competing with private firms in providing technical services or new technological developments. In such a situation, the laboratories' access to public funds would give them an inappropriate advantage. Such situations are more likely to arise the less DOE and laboratory management know about the commercial application in question. We are already aware of some instances in which such competition appears to have occurred, and we are concerned that the problem may become more serious in the future.

All of these problems can be ameliorated if the industrially-related R&D done by the laboratories is focused on industries and applications which are themselves instrumental to achieving the DOE's public missions. That is not to suggest that laboratory directors should be denied the flexibility to initiate new technical projects at the periphery of current activities. Making room for individual and small group initiatives of this kind is an important way to keep the laboratories lively and exciting places to work. If such a project becomes large enough, though, a judgment must be made as to its fit with the rest of the laboratory's activities. This will depend not only on technical compatibility but also on the project's relevance to the laboratory's (and hence the DOE's) missions.

The current industrial partnership activities of the laboratories have brought them into contact with a number of industries that do not lie within the Department of Energy's traditional domain. In addition to the drawbacks specified above, these new involvements also suffer from a number of other problems:

- They are unfocused. Without a connection to the Department's larger public missions, these initiatives are invariably add-on activities, managed on a case-by-case basis, through a well-intentioned but necessarily ad hoc relation to industry. The laboratories should not aspire to become research boutiques for industries.

- Their short-term benefits are often oversold. Even when useful results flow from these partnerships, the benefits to the participating firms generally will not be evident for some time, and are inherently difficult to measure.

- They distract the DOE and its laboratories from their public missions, diverting both intellectual and material resources.

4. Technology Partnership Mechanisms

Cooperative Research and Development Agreements (CRADAs) currently occupy pride of place among the array of mechanisms employed by DOE to encourage laboratory-industry cooperation in technology development and transfer. Introduced to the laboratories in 1989, the CRADA mechanism reflects the intent of Congress, developed and refined in legislation over the preceding decade, to ensure a greater degree of laboratory involvement in industrially relevant activities. Industry criticism of the CRADA mechanism has focused on the slow and uncertain nature of the negotiation process. The DOE and the laboratories have responded to these concerns. Nevertheless, there remain wide variations across the laboratory system in the speed with which CRADA negotiations are being concluded. Ironically, recent contractual reforms intended to encourage more businesslike relations between DOE and its management and operations (M&O) contractors at the laboratories risk complicating laboratory/industry negotiations because the contractors are more strongly motivated than before to secure rights and to take direct profits from laboratory-generated intellectual property. The Task Force believes that the contract-driven M&O motivation to profit from laboratory intellectual property will act as a significant barrier to industry acquisition and subsequent commercialization of laboratory technology in the future.

Other criticisms focus on the lack of independent review of the operation and outcomes of CRADAs[1], and also the process used to select industrial partners for these agreements. Regarding the latter, when a CRADA proposal is submitted there is typically no solicitation of competing proposals, nor an announcement that public resources are available for such work and will be awarded exclusively to the applicant company if others do not step forward. Nor is the peer review process as rigorous as other DOE programs; independent expert evaluations of the validity of the proposed work and its relevance to the DOE mission are not routinely solicited. These practices can be traced to earlier legislative and executive branch attempts to reorient the laboratories towards industrially relevant activities as rapidly as possible. However, their practical effect today is to leave the laboratories vulnerable to charges that the selection process is flawed and that the competitive playing field is being unfairly tilted towards the laboratories' chosen partners. In fact, DOE routinely and successfully implements several different models of independent peer review, at least two of which are relevant to the present situation -- the allocation of DOE beam line resources, and the allocation of funds under the Small Business Innovation Research (SBIR) program. The DOE should consider applying these practices to CRADAs as well.

5. Metrics

One of the most common metrics used by DOE and others to assess the technology transfer performance of the laboratories is the rate at which new CRADAs are being signed. An obvious limitation of this metric is that it measures inputs rather than outcomes, and the latter are likely to vary greatly from one CRADA to another. It also fails to distinguish among different classes of CRADAs. Some pertain to work that the laboratories would have undertaken anyway, even if no CRADA had been signed. Others entail a significant departure from a previous program of work. In some cases technology transfer activities have reportedly drawn the laboratories away from their primary missions. In others, resources appear to have been diverted away from fundamental research to support them. In such cases, a cost-benefit metric may be the only meaningful measure of performance. We also note that none of the laboratories appears to be measuring the effectiveness with which technology is being transferred in from industry or the universities to support their missions. In general, we recommend that greater emphasis be placed on outcomes in the measurement of technology transfer performance. The question of performance metrics for the laboratories in discussed further in Section VII of this report.

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[1] Post-CRADA follow-up work at the laboratories would be classified as 'work for others', for which the industrial partner is required to pay the full cost. Many industrial partners would at that point be inclined to pull the work back into their own facilities. Since the laboratories would then lose their DOE-budgeted CRADA financial resources, in the absence of independent review there might be a tendency for valid and successful CRADAs to continue beyond the completion of technology transfer and into product development or some other industrial activity.

B. Recommendations

1. *The government-funded technology transfer/industrial competitiveness activities of the national laboratories should be focused on industries and areas of technology that contribute directly to the DOE's primary missions in national security, energy and environment.* Industrial competitiveness, broadly defined, has no place as a stand-alone mission of the laboratories, but rather should be regarded, and treated, as a derivative of their primary missions. The idea that the laboratories are, or could become, cornucopias of relevant technology for a broad range of industries is a myth.

2. *Laboratory directors should have the flexibility to initiate or to approve new technical projects at the periphery of current laboratory activities*. But if these initiatives are unrelated or only tangentially related to the public missions of the DOE, either different sponsors should be found or the work should be spun off into the private sector once the level of activity exceeds what can reasonably be funded out of the laboratory director's limited discretionary account.

3. *Competitive selection and more rigorous technical and merit review by external experts should be applied broadly within the Department's CRADA activities*. There are several alternative models available to DOE for this purpose, including programs currently administered by the DOE itself. One strategy would be for DOE to link some portion of its SBIR programs to CRADA activities. The two programs have similar legislated commercialization objectives, which should make them compatible. In addition, making this linkage would help to achieve a higher commercialization rate by maximizing the available resources (both cash and in-kind R&D). Improvements in the CRADA selection and monitoring process need not, and should not, incur any penalty in the timeliness of the process. The DOE should continue to focus on reducing the time required to complete CRADA negotiations and on bringing the laboratory system as a whole up to the standard of best practice established by the leading laboratories.

VII. The Governance and Organization Issue

A. Introduction

In accepting its privileged assignment of suggesting alternate futures for ten Department of Energy laboratories, this Task Force could have limited itself to the conventional objective of most Federal advisory studies and only presented findings and proposals that might be adopted within the accepted governing processes of the times. But one critical finding is so much more fundamental than we anticipated that we could not in good conscience ignore it. The principle behind that finding is: Government ownership and operation of these laboratories does not work well.

The laboratories are purported to be contractor operated. The system is titled Government-Owned, Contractor-Operated or GOCO. The GOCO system was a promising concept. The Contractors, as contractors, do yeoman work. The system has been employed for decades. But in that time it has followed the natural course of government's proclivity to govern more. The owner wants to take charge more. Most able government personnel aspire to add value. Translation: add more governance. This makes work for more government personnel, increasing the size of the operation, increasing still further need for management, *ad infinitum.* Congressional policy has significantly driven this consequence.

Numerous instances of poor DOE regulatory and management practices have come to the attention of all members of the Task Force during its investigation of the national laboratories. The system has been tried long enough; the evidence is in. Today, the system has evolved to a virtual GOGO - Government-Owned, Government-Operated, but certainly strongly government-dominated system. And the momentum in that direction has been unabating. This "ship of state" (the Congress/Department/Contractor/Laboratory system) is ponderous. Evidence in these regards is almost limitless. Appendix A illustrates the excessive oversight and micromanaging with an abbreviated litany of some forty anecdotes. However, general areas of excess are:

- Growing emphasis on DOE administration and support organizations and their oversight and compliance roles;

- Expanded DOE field office management oversight roles, which are commonly duplicative of other management channels;

- Increased audit oversight and too many review groups, both internal and external. The increasing costs of dealing with review groups, both in resources and in their consumption both of senior and junior staff time, leads to paralysis and interferes with operations; and

- One array of difficulties with which DOE has not yet been able to deal properly is ironically self-inflicted. Far too much influence has been ceded to non-regulatory advisory boards, such as the Defense Nuclear Facilities Safety Board. Such organizations generate recommendations with no apparent cost / benefit analysis, resulting in significant unnecessary expenditures and productivity losses.

As we were in the final stage of editing our report and preparing for submission, the Department initiated a Strategic Alignment effort to address some of these issues. The initiative is described in the announcement and explanation documents of the Department which were released on December 20, 1994. The Task Force applauds the Department's acknowledgment of the problem and many of its intended actions. The Task Force presumes no credit for this happening. Rather, we note that the establishment of this Task Force was itself an initiative of the Department a year earlier. The natural consequence was to put the governance issue into public play, and the Department has been responsive to the inevitable greater emphasis of this governance issue to its credit.

There is heartening evidence from inside the Washington Beltway regarding the suffocating consequences of micromanaging. It confirms our finding that something really substantial has to be done soon or the vitality of the laboratories will founder. But our evaluation of the seriousness of the problem and the limited promise of a continuing federal governance system even though partially muted, per the new Department proposals, is that efforts such as announced will be seriously insufficient.

It is the Task Force's position that top-down, command and control bureaucracies are counterproductive for these laboratories. Pundits may dismiss this reality. But if the laboratories are to optimally enhance America's energy interests, these are the realities of group dynamics essential for the laboratories to contribute their best.

Thus, our first operations recommendation is that we must begin to evolve, over a period of one or two years, the development and implementation of a new modus operandi of Federal support, based on a private sector style "corporatized" laboratory organization system. This proposal embraces the counterintuitive, yet newly-further-confirmed institutional principles that allow the subsets of an organization to operate more to the principles of trust and self initiative. From these principles accrue greater flexibility, quality, and productivity; as well as the revitalization of an operating institution and the heightened accomplishment of its mission.

There have been many studies of the Department of Energy laboratories. As one reads these reports, one recognizes that the items which were recommended in previous reports are for the most part recommended in most subsequent reports. As each past study has taken place, people of good intention do make sincere efforts to "fine tune" the system. However, the Department and the Congress should recognize that there has been little fundamental improvement as a function of past studies. In fact, the cost-benefit relationship of the Department/Laboratory operation has continued to degrade. If there is to be a significant benefit from this study, it will have to come as a function of a major organization and governance change.

We suggest that the country must try one or more concepts that are radically new in order to revitalize the laboratories and to achieve significant improvements. If some parts of a

bold solution were to prove to be not as beneficial as this Task Force is confident that they would be, that unto itself should not be a matter of concern. The laboratories and the country would still be better off than they otherwise will be from the continual repetition of federal governing policies. The system is now so concerned with details that it cannot work the big picture.

Previous reviews of the laboratories have taken a top down approach. This one focused otherwise. Early on we invited the involvement of the people active in the system from the bottom up. It is evident to us that the competence is there in the laboratories to make these changes. Properly oriented and supported with quality management training, this inherent competence can make enormous changes in the productivity and effectiveness of the laboratories.

B. The Need to De-Federalize

The principal organizational recommendation of this Task Force is that the laboratories be as close to corporatized as is imaginable. We are convinced that simply fine tuning a policy or a mission, a project, or certain administrative functions will produce minimal benefits at best.

The government should be the customer of the laboratories. The Department itself should be an instrument of that customer function. The Department must become a world-class customer. World-class commercial customers do not tell their suppliers how to do things. They simply buy a result for a given price. World-class commercial suppliers are not audited by their customers. The commercial practice sets the quality of operations standards to which the government should commit.

The Task Force is aware that there are numerous laws on the books that specify that things should be done the way they are currently being done. The Task Force recommends that a clean sheet of paper be applied to the design of a new laboratory governance system by the Congress and the Department. The Task Force notes that over the years creative variations of government structures and funding have been flexibly initiated, including the Defense Advanced Research Projects Agency (DARPA, now ARPA) the Federal National Mortgage Corporation, Mitre Corporation, and many others. This precedent justifies the application of imaginative and practical forms and financing of organizations such as we propose, including the circumscribing of prescriptives, audits, and other overhead.

One attractive model that we outline here is the creation of a new not-for-profit R&D corporation or corporations, formed with many of the basic principles and criteria of a conventional commercial corporation. Although the DOE weapons-oriented laboratories could be omitted from the proposal outlined here, many if not all of the other DOE national laboratories at least are candidates to be included in this corporation. The not-for-profit corporation(s) will be governed by a Board of Trustees, consisting primarily of distinguished scientists and engineers and experienced senior executives from U.S. industry, appointed to staggered terms by the President of the United States. This Board will select the chief executive officer and other principal officers of the corporation. Each lab would similarly have a trustee advisory board elected by the parent board.

The Department of Energy will be the government sponsor of this new R&D entity. Initial funding of the corporation will be in the form of Congressional line items in the DOE budget in each of the four mission areas of national defense (if the weapons laboratories are included in the "corporation"), energy, basic research and environment; and another line item for "other programs," a miscellaneous category including health, facility improvement, global ecology, economic betterment, etc. Each of those missions will contain funding that can be used across the full R&D spectrum from basic research to development and technology demonstration. The budget should be for some multiple of years with our Task Force recommending that a decline be built into these funds over a five year period. Renewal of federal funding will be subject to Congressional approval.

Allocation of these funds among its several individual laboratories will be made by the corporation. The management of the corporation will deal with the traditional agencies for which the work is usually done in refining the allocations. Micromanaging or "earmarking" of these allocations should not be made by the Congress or the Department.

The corporation will be permitted to serve the particular needs of the Department of Defense, the Department of Energy, as well as any others in government, the universities and the private sector, just as any corporation would serve its customers. The corporation will be subject to normal commercial criteria of operation, including conventional outside auditors, as are required of other corporations. The corporation and its several laboratories will be subject to the normal influence and control of those agencies of the state and federal government that normally have authority over a United States corporation. If it wishes, the corporation may hire one or more contractors, similar to those now engaged by the DOE, to assist it with aspects of the management of its affairs.

The laboratories will be challenged to embrace the new higher standards of self initiated, self determined, quality service to customers that are being perfected in the private sector. As a result, the Department will receive more "bang for the buck". There is a spectrum of possibilities from which a new system of governance and operation can design the needed better way. Although we have outlined one specific embodiment of a corporate structure, many variations are possible. As mentioned above, the weapons-laboratories may or may not be included in such a "corporatizing," although some Task Force members feel including them would be both useful and successful. Various options also exist for ownership of the plants and facilities. For example, they may be leased to the corporation on a long-term or rolling basis, or they may be transferred outright. Combinations of operating plans can be staged in transition to a "far-less-federal" plan as a further possibility.

In this model, the DOE is the customer of the corporation. Funding for the corporation would be allocated to the DOE by Congress in a small number of broad blocks as described earlier. Allocation to specific projects would be the responsibility of the DOE, with no earmarking from Congress beyond quantifying the amount of money given to each broad block. Congress would indicate its level of satisfaction with the job the DOE was performing by increasing or decreasing the funding to each broad block. The DOE, in turn, would indicate its satisfaction with the job the corporation and its parts are performing by increasing or decreasing the level of funding for each project.

The contemporary official view is that the laboratories must conform to the so-called federal norm. The Task Force believes it is time to run a major experiment with a modest part of the federal budget and have the laboratories test out a progressive concept. The current annual budget of some $6 billion for these laboratories is modest compared to the entire government budget, or even the budget of many large corporations. At minimal risk, the country could experiment with a new way of doing things. It is just such quality of change that is renewing the rest of America to heightened achievements and increased competitiveness with resultant ability to achieve improved results with a smaller budget.

A compelling question is: what are the cost savings consequences of the change in governance and reorganization? Each time we tested the question on the players–those who work in the laboratories–the least called out was "10% savings"; to which most all other respondents would strenuously interject "40%," "25%," "50%," "20%." In private industry it is virtually axiomatic that a dedicated, empowered, quality program will generate better than 20% cost improvements with greater values in significantly improved quality of output of services, engineering and product.

As described in its Strategic Plan, the Department of Energy sincerely desires to be people oriented, to value creativity and innovation, to commit to excellence, to work in teams, to embrace leadership empowerment, and to pursue accountability. Regrettably, the fundamental system and structure under which it is obliged to operate cannot achieve the first five objectives to near the degree the Department leadership intends. The Department further recognizes that certain critical success factors are communications, trust, and human resources. Again, its hands are tied as it is obliged or elects to overadminister. The activities that it is obliged to direct and order are a countervention of the value of trust. The laboratory human resources are demotivated by such an environment.

The above are our recommendations of the type of substantial reorganization which could be expected to result in an improvement of between 20 and 50 percent in the effectiveness of the laboratories themselves, on top of significant staff and overhead economies in the Department. For example, under the proposed structure the present DOE Field Offices might have no role to play vis-à-vis the laboratories.

In implementing the proposed corporatization, a separate detailed identification of those services which only the government can provide as a supplier should be identified. One example may be the transportation of nuclear or other dangerous materials. These services could be purchased by the laboratories from the government.

Certain of the liability responsibilities that have been placed on the government's shoulders must be continued (at least relating to past government assignments, such as nuclear materials) absent bad faith and willful misconduct on the part of the laboratory corporations.

C. Other Subjects

1. Financial Resource Planning

The laboratories must have a reasonable predictability as to their financial resources. In this way, the people who work at the lab will be more secure in their professional futures, and will be further motivated to become the supremely productive entity to which they aspire. Some form of multiple year fund guarantees are essential. We must find a way under the "clean sheet of paper" doctrine of making this possible. We must further be willing to find ways of engaging cooperatively with foreign sources of funds for research and development, as such cooperative work will often multiply the effectiveness of the domestic work to our benefit.

2. The Laboratories As a System

One of the values of this Task Force process has caused the laboratories to come together as a system to a greater degree than they had been inclined or directed to do in the past. The laboratories could move to a virtual system, such as is described elsewhere in the report. This would be more readily accomplishable under Corporate structuring.

3. Technology Roadmaps[1]

The Task Force suggests that there be a more liberal application of the technique of defining technology roadmaps for those classes of technology which would yield to a roadmap. We urge that this management process be employed where practical. All appropriate constituencies from government, academia, industry and the laboratories who have a competence at contributing to a given roadmap, should be called upon to define such roadmaps in a manner similar to that which has been accomplished by the semiconductor industry.

4. The Globality Issue (vis-a-vis non-Defense technology)

These laboratory Corporations will be serving other private corporations. They must not be unduly inhibited by policies that restrict the use of the technology to American sites or to American personnel. This is a global energy economy and general economy. All users of knowledge must be able to use the knowledge, wherever that knowledge can best serve their customers. If that requires doing some further engineering or production overseas, such investments will do nothing but enhance the economic strength of America through exports and the lowering of trade barriers, with the eventual desired job creation at home. Some further liberalizing of the "design and manufacture only in America" must be effected.

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[1] A technological development plan which outlines, over time, the evolution of technological capabilities and provides milestones by which progress can be measured.

5. Metrics

At the onset of the Task Force study, a request was made to identify metrics of the laboratories' work. In no order of importance these can include: adherence to budgets, adherence to project schedules, patents filed, inventions disclosed, estimates of cost savings from a given potential application or actual application of technology, lists of technical problems solved, research dead ends now avoidable, the quantity and quality of research papers published, lab/university and lab/industry interactions as well as other collaborative work anecdotes, including CRADA results. The presently overused metric of "jobs expected to be produced from a CRADA" should be discouraged as speculative at best.

The degree to which a laboratory engages in the process of renewal would be a significant measurement. Science change, laboratories change, and laboratories' missions change. Laboratories such as Lawrence Livermore, for example, have changed over the last forty years having naturally gone from an 90 percent national security orientation to a 60 percent other class of activities orientation. Major projects like the Bevatron at Lawrence Berkeley Laboratory, which played an early important role, have been closed.

It is worth having metrics on how well the government is performing to make possible the better work of the laboratory and to expedite the application of certain of the output of the laboratories. For example, to what degree is the government becoming a better customer of the development, to what degree is it moderating regulations, to what degree is it making aid available tied to the development to encourage the commercial exploitation, to what degree is it making available low cost capital, what are the practical honorable ways of reducing the risks that would be borne by investors, how is the network of extensive testing facilities used to enhance and advance the application of products, how willing is the government to identify with the beginning success of a technology roadmap to support more vigorously extensions of achievements on that roadmap.

When all is said and done, the nature of the laboratories as a multidisciplinary system providing solutions to some of the truly challenging puzzle of nature, will require a qualitative evaluation more than anything else and a long time horizon to best measure the results.

6. Quality

The Department of Energy and most of the laboratories have embraced the language of quality management. They have studied the issue, they articulate the principles and they are educated on the fundamentals. The pursuit of these quality initiatives and the embracing of the practical methods and procedures of quality should produce values for the Department and the laboratories.

However, the likely end result will be limited because the principal authorities do not adequately appreciate a major way one improves quality: the elimination of functions. One must simplify procedures and get down to their essences, and the people in government are not prone to this. They administer quality in, control quality in, and audit quality in. Exactly the opposite is obliged. One cannot have a quality effect through the manner in which government imposes itself on the operations of the laboratory. We call for a true quality program. It must start at the top. It must start with the Congress and the Administration. When it starts there with proper respect for the essential principles, the ultimate result will require the government to "get out of the way" so that the laboratories can practice the quality principles that are practiced in the private sector.

Consider this excerpt from an article, "Why to go for Stretch Targets," in Fortune Magazine: "Finally – and here's where stretch targets differ from old-fashioned top-down management by fiat that U.S. companies have spent years unlearning – the CEO has to get out of the way. The job belongs to managers in the field, workers on the plant floor, and engineers in the labs."[1]

7. Facilities

There are superb facilities at the government laboratories. There are also facilities that have been allowed to languish. The insufficient attentiveness of the Department in keeping up the quality of existing facilities or the disposition of obsolete facilities is evident.

There should be a gradual reinvestment by the federal government in repairing research laboratories, and upgrading research instrumentation. Once that has been achieved after a period of years, the responsibility should be turned over to the laboratories. The laboratories should be expected to maintain and renew facilities in the same manner that the private sector is obliged to perform the updating, the tearing down and the construction of new facilities from their then aggregate budget assignments.

Elements of such a facility renewal plan should include:

- Facility consolidation, including decontamination, decommissioning and disposal of all non-essential structures and equipment.
- Upgrading all essential facilities to meet modern safety facilities.
- Initiate an enhanced maintenance program for all nuclear facilities bringing ongoing maintenance to appropriate industrial standards.

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[1] Fortune Magazine, November 14, 1994, pg. 146

- Complete and maintain all safety related documentation.

- The laboratories should see to the training of the work force to successfully implement and maintain safety and environment systems regarding such facility.

If we do not correct this facility situation, the cost of managing and maintaining facilities "today's way" will soon be so costly that it may substantially consume the laboratories' budget. If the full management responsibilities of the facilities are placed in the hands of the management of operations (that is, the laboratory directors responsible to their public trustees), we anticipate that the cost of facility maintenance will be significantly improved.

D. Recommendation

1. *Over a period of one to two years, the Department and Congress should develop and implement a new modus operandi of Federal support for the national laboratories, based on a private sector style -- "corporatized" -- laboratory system.*

VIII. Summary of Recommendations

For detailed versions of the following recommendations please refer to the body of the text.

A. National Security

1. The primary mission of the weapons laboratories must be a safe, secure and reliable nuclear stockpile in the absence of explosive testing. Science-based stockpile stewardship is the approach chosen be the Department to achieve this mission. It requires the following rank-order priorities:

   - Attracting and retaining skilled scientists, engineers, and managers over the years ahead with the expertise required for the complex and changing stewardship role;
   - Enhancing surveillance of weapons in the stock pile, during dismantlement, and of the nuclear materials that accumulate as a result of the dismantlement;
   - Continuing hydrodynamic testing to cope with problems;
   - Assessing problems, reanalyzing previous data through numerical simulations, and developing appropriate data bases; and
   - Sustaining the scientific process of inquiry through experimentation.

2. Non-proliferation, counter-proliferation, verification, and intelligence support have become a major mission along with stewardship of the nuclear stockpile. The Task Force notes that organizational compartmentalization within the Department complicates and makes difficult the appropriate inter-relationship and funding balance between support and non-proliferation, and recommends that the Department's organization reflect their importance and interdependence.

3. The Task Force believes Lawrence Livermore National Laboratory should retain enough nuclear weapons design competence and technology base to continue its activities in non-proliferation, counter-proliferation, verification, an intelligence support, to provide independent review for several years while alternative approaches to peer review are developed, and to participate in weapons relevant experiments on the National Ignition Facility (NIF). Lawrence Livermore National Laboratory would transfer as cost-efficiency allows over the next five years its activities in nuclear materials development and production to the other design laboratory. Lawrence Livermore National Laboratory would transfer direct stockpile support to the other weapons laboratories as the requirements of science-based stockpile stewardship, support of the DoD nuclear posture, and the status of the test bans allow.

4. The Task Force recommends continued funding support for the Dual-Axis Radiographic Hydrodynamic Testing (DARHT) facility; continued near-term support for the Los Alamos Neutron Scattering Experiment/Los Alamos Meson Physics Facility (LANSCE/LAMPF); continued pursuit of advanced computing, including computing through workstation networks; and proceeding with the National Ignition Facility (NIF) as a research facility, balanced with respect to other major investments.

5. The Task Force recommends that future production needs should be based on residual capabilities of Pantex, Los Alamos National Laboratory, and Sandia National Laboratories, and believes that no further investments in production capability are needed at this time.

B. Energy, Environment, and Related Sciences and Engineering Role

1. The Department should organize itself to achieve greater integration among its applied energy programs, between these programs and industry, and between the applied energy and basic energy research work performed at the laboratories.

2. The integration of energy and environmental considerations should be a fundamental organizing principle for much of the Department's activities.

3. The Department and the national laboratories should move promptly to establish clear mission statements for the laboratories which will be utilized as tools for budget decisions and long-term strategic planning.

4. Mechanisms should be established to enhance the management of the multi-program laboratories as a system.

5. The Department should establish lead laboratories according to mission assignments and programmatic strengths.

6. The Department should establish Centers of Excellence within the laboratory system.

C. Cleanup of Radioactive and Chemical Wastes

1. Sustained improvements in DOE management and leadership are needed both at senior levels in the Department and in positions below the Deputy Assistant Secretary level.

2. A comprehensive remedy to the array of problems plaguing the EM program can only be achieved by a substantial commitment and high priority addressing the challenges of this program.

3. Closing the science/engineering - applications disconnect should be dealt with by the establishment of an "Environmental Advisory Board (EAB)," reporting to the Under Secretary.

4. The national laboratories together have a critical role to play, a role very much larger than at present, in performing high-quality science and engineering for the Environmental Management program.

5. The Department must take positive steps to make the national laboratories available to the entire government system as a powerful environmental technical resource.

6. DOE must address more forcefully the task of renegotiating the unrealistic or unfeasible elements of the cleanup compliance agreements that it has made with State and Federal agencies.

7. Much more comprehensive involvement by members of the affected public in decision making should be employed to reduce the bitterness, distrust and distress that continues to provide a troublesome element in DOE's conduct of its affairs.

8. The bulk of the EM environmental challenges, although presenting no immediate threats to public health or safety, still should be addressed with a heightened sense of urgency.

D. Science-Engineering

1. The Department of Energy should move to strengthen its efforts in fundamental science and engineering, both at the laboratories and in the universities.

2. The DOE should pay close attention to ensuring that a proper balance is maintained between the universities and the national laboratories in the performance of DOE-related basic research, both now and in the future.

3. Support for operating and maintaining large facilities in the DOE's Office of Energy Research should be budgeted separately from funds for specific programs.

4. The DOE should redouble its efforts to achieve better integration of basic research, technology development programs, and their applications, particularly in the area of environmental remediation.

5. Basic research at the laboratories should be more fully integrated into the national and international research community.

6. There should be additional stimulation of laboratory-university cooperation in basic research.

E. Economic

1. The government-funded technology transfer/industrial competitiveness activities of the national laboratories should be focused on industries and areas of technology that contribute directly to the DOE's primary missions in national security, energy and environment.

2. Laboratory directors should have the flexibility to initiate or to approve new technical projects at the periphery of current laboratory activities.

3. Competitive selection and more rigorous technical and merit review by external experts should be applied broadly within the Department's CRADA activities.

F. Governance

1. Over a period of one to two years, the Department and Congress should develop and implement a new modus operandi of Federal support for the national laboratories, based on a private sector style – "corporatized" – laboratory system.

Appendix A: Excessive Oversight And Micromanaging

The present structuring and operation of the laboratories is governed by the class of contracting: Government-Owned, Contractor-Operated (GOCO).

Were it possible to have a true government-owned, contractor-operated system it is conceivable that there could be a continuing activity under such a rubric. But wherever we turn we see evidence of nothing but a government owned and more government operated system.

As a function of the detail with which the Congress prescribes what should be done in the laboratories and the Congress's obsession with the issue of accountability, the Department is driven both to honor the prescriptions from Congress and to overprescribe in order not to be at risk of failing to be super attentive to the Congress's intentions.

The net effect is that thousands of people are engaged on the government payroll to oversee and prescribe tens of thousands of how-to functions. The laboratories must staff up or reallocate the resources of its people to be responsive to such myriads of directives; more and more of the science intended resources are having to be redirected to the phenomenon of accountability versus producing science and technology benefits.

This report could contain thousands of supportive pages from the thousands of involved people who unanimously complain of this phenomenon. We will merely illustrate with a few examples that could be multiplied were we to fully evidence this overaccountability practice.

The essence of our governance is to account for all the how-to's in contrast to "what" the laboratories contribute.

As a consequence the system is rife with:

- Hundreds of full-time equivalents are attending to issues per laboratory to see to the meeting of DOE requirements that are in excess of Federal, state and local regulations and/or are in excess of requirements for a comparable, commercial activity

- Hundreds of thousands of pages of budget information documents are prepared and circulated throughout the system. Many of the laboratories find themselves submitting their budget documents to well over one hundred offices.

- Department of Energy orders to the laboratories range from a few to a few hundred pages in length and are prescriptive to detail processes

- There are some 30 thousand individual requirements embodied in these orders to certain of the major laboratories

- Once an individual order has been determined as obliged to resolve a particular situation it is more often then spread universally throughout the system without any differentiation as to the uniqueness of the initial concern. For example an employee of a contractor only indirectly related to the principal work of a laboratory was involved in an automobile accident. This generated a prescription that all employees who drive their vehicle on laboratory affairs were obliged to take defensive driving lessons with the consumption of an inordinate number of hours and excessive dollars in unnecessary training costs.

- Auditors and inspectors often by the dozens descend often daily on many of the laboratories. The laboratories have to staff up to be responsive to the engagement and then are obliged to spend a significant amount of time putting in place whatever are the prescriptions of these auditors. Virtually every audit that was accounted to the Task Force added a cost, versus saved a cost.

- Almost everyone must follow new rules and orders not necessarily relevant to their situation, if perchance a few have erred elsewhere.

- DOE Headquarters has insisted that copies of DOE terms and conditions be attached to all file copies of literally thousands of small purchase orders in order to document that these terms and conditions had been transmitted to vendors.

- Procurement management directives have obliged the hiring of additional support staff, vastly increasing written procedures and hiring of procurement consultants.

- Construction projects and operational and equipment activities are to be managed to various different tracks of regulations complicating the common sense approach to resolving the particulars of such functions way beyond what other institutions in society bear.

- The capital asset management process and condition assessment survey is a hornet's nest of complex documentation without cost benefit consequences.

- Senior audit and inspection officials state that they must concentrate on reviewing and insisting on processes, audits, etc. because there is to them little demonstrated "product" against which to evaluate if the labs are producing a knowledge value for the money appropriated. Process is a surrogate of product.

- Department of Energy people report that many Congressmen believe that the Department of Energy should treat the oversight of employees of the private contractors just as if they were employees of the government.

- More controls are in the offing regarding overtime, pension costs and decisions regarding make or buy.

- From time to time the Congress or the Department allocates funds for a general research program and then put fences around what the money can be spent for.

- Congress and the Department often specify what it wants done but does not allocate the money for that new additional function.

- Funds are segmented to what are colloquially called "stove pipes" whereas the aggregation of funds would be far more effective and efficient allowing the people who know what the technology is all about to work out the allocations.

- Consortia are a recommended institutional way of the private sector interfacing with the laboratories. AMTEX (AMerican TEXtiles) is one such consortia. It took scores and scores of CRADAs to be written in order to have a relationship with the one consortia. Certain consortia that would want its work done most effectively in the laboratory system cannot get the work done in the appropriate laboratory.

- The system is input oriented versus output oriented.

- Each laboratory acknowledges that it has more people than it needs because of the Federal prescriptions and the inability to add the flexibility of assigning people in the manner that would be most productive.

- Environmental, safety and health objectives are worthy and all reasonable ones should be accomplished. The degree to which the Government is specifying how these are to be handled is beginning to absorb virtually as much funds as funds remaining for science.

- A laboratory wanted to outsource its cafeteria service. The Government obliged that the outsourcing of the 22 cafeteria workers required the laboratory to write a complete workforce restructuring plan, in spite of the fact that the authorizing act for such was intended to deal with fundamental structuring or changes in missions versus a minor change in a department. Incidentally, all of the 22 people would have been candidates to work for the outside supplier if that were to their and the supplier's best interest.

- Everyone wants in on the act--headquarters, the DOE area office, the DOE field office, program offices of the DOE, the Defense Nuclear Facilities Safety Board (DNFSB), the Department of Labor's office of Federal Contract Compliance, the EPA, the General Accounting Office (GAO) and the state where the lab is located. Each has oversight entities. Each thinks that their audit is the most important. Most audit without any coordination with others. Some audits take as long as six months. The number of auditors in an audit team vary greatly but has been as high as 150 people. The major financial impact of this is not the cost of the auditor's time but the cost and lost productivity of those interfacing with the auditors. This leads to an enormous escalation of cost. Possibly the greatest negative effect is the affect on the motivation of the scientists and engineers, all of whom are loyal to their science and loyal citizens wanting to be able peers with their respected associates in the laboratory. But we heard from any number of people the message that can be simply summarized that "more and more of us are more concerned about our job than doing the job." Too much time is distracted to the unpleasant and unproductive aspects of the job. An increasing number, though still a minority, lean to questioning the conditions of the job. Good people are leaving.

- The Department of Energy acknowledges that waste management and environmental remediation programs are the most rapidly growing Department of Energy demand on funds. To the extent that these obligations which derive from defense functions of decades ago could be more clearly segmented, the other major future interests including new science for environmental subjects, could stand alone.

- Starts and stops of assignments have caused an inordinate unproductive waste of funds. For example, the mesas around Los Alamos are strewn with the skeletons of facilities that were started with much enthusiasm on the part of the laboratory, the Department of Energy and Congress but were prematurely terminated before completion because the annual funding appropriation could not be sustained. Often these projects were more than 75 percent complete at the point of cancellation. The annual programming of funds is a major waste. Multiyear programming should in some fashion be accomplishable, providing the confidence of predictability.

- The very process of annually having to resell a program is an act of inefficiency.

- The total laboratory program (10 laboratories, $6 billion budget, 17 thousand active R&D personnel, etc.) is modest in size compared to many of the large corporations. Any corporation that you would compare this to would have but a small fraction of audit costs compared to what is involved in the oversight of the DOE laboratories. The laboratories are run by the same high quality class of honorable people (though they, like corporate people, make an occasional mistake or misallocation) and do not need to be overseen in the fashion that is prescribed. Those in the private sector rarely audit and inspect their suppliers' business processes, and for the most part no corporation allows any of its customers to audit and inspect its activities. The private sector does respect the laws that apply specifically to financial accounts, safety factors, etc., and the government laboratories should be limited to the same class of oversight.

- Recently the Department has been engaged in a sincere interest to improve the contracting process aimed at having the contracts be performance-based. Yet in the first major paragraph of the news announcement concerning performance-based management contracting, it says "the reforms would increase competition for DOE business, hold contractors more accountable for fines and penalties, reduce excessive outside attorney fees, require a specific performance criteria and measures on all contracts, impose stricter cost controls on expenses such as administrative support, maintenance, pensions, overtime and property management." The document that **explains the performance-based contract is scores and scores of pages long.**

- Page 46 of the contract explanation document indicates that the Department's current information system does not provide the kind of data needed to manage contractors effectively. The words convey: the Department wants to manage.

- The document pleads the case that all the various contract administrators, inspector generals, audit agencies, etc. are under staffed and need more people.

- There has been an avalanche of DOE orders including 4,800 project orders and 8,400 Environment, Safety and Health (ES&H) orders with from 200-400 oversight reviews per lab per year.

- There are at least 12 principal layers of management between the assistant secretary for defense programs down through the layers of DOE and the laboratory program management to the bench scientist working of a project financed through defense programs. There are additional oversight and administrative chain of commands through the field offices which probably add two or three more layers.

- One array of difficulties with which DOE has not yet been able to deal properly is ironically self-inflicted. Far too much influence has been ceded to non-regulatory advisory boards, such as the Defense Nuclear Facilities Safety Board (DNFSB). Such organizations generate recommendations with no apparent cost / benefit analysis, resulting in significant unnecessary expenditures and productivity losses.

- There is neither a mechanism within DOE to evaluate and stand against poorly-taken DNFSB edicts nor to ensure Department-wide compliance with those edicts judged appropriate. The Board has itself noted this last defect.

- At Pacific Northwest Laboratory, for example, overhead costs of Environmental Safety and Health (ES&H) increased 40% over a four year period with no demonstrable improvement. A study of 13 DOE labs indicated that ES&H funding increased 100% and manpower increased 50% between 1985 and 1990. Safety performance was independent of funding and negative indicators (lost work days, radiation exposure, etc.) remained constant or increased.

- In many areas the regulations parallel rules already enforced by agencies outside of DOE under federal and state legislation. Frequently they prove unnecessarily stringent. As an example: Radiological control of radiation sources at Lawrence Livermore National Laboratory requires sources 100 times smaller than a Coleman lantern mantle and 300 times smaller than a smoke detector to be treated under the same standards as larger sources.

- EG&G, the management and operations (M&O) contractor at Rocky Flats, recently spent about $500,000 to write a record of decision to document that no further action was required to close out one of the Individual Hazardous Substance Sites (Operable Unit #16), mostly free of mixed waste contamination, where no further pumping or digging was needed.

- This was the result of an environmental gridlock involving the Comprehensive Environmental Response, Compenstation, and Liability Act (CERCLA), the Environmental Protection Agency (EPA) and the Colorado Dept. of Health, which DOE was unable to resolve.

- Requirements for maintaining the "safety envelope" at the Rocky Flats site, which among other matters involves 245,000 surveillances annually, preparing inspection reports and maintenance improvement records, costs the plant $100 million per year, a level that senior management considers "very unreasonable." Many staff members echo the desire for a clarification of goals for the site. Moreover while the delays mount, the experience base continues to degrade as seasoned employees retire or quit.

Appendix B: If GOCO System Is Obliged

If the authorities oblige that the GOCO system is retained, the Congress and the Department must improve operational efficiencies and motivational conditions of the federal system by correcting the policies and practices listed below. If these are not completely revised the Congress/Department/Laboratory system is destined to bear excessive unaffordable, micromanaging costs and demotivational consequences. It will follow that plan to deactivate and/or dispose of the laboratories at some liquidation value will be inevitable because the public will not countenance the high cost/low value output that will be destined.

Base DOE Oversight on Laboratories' Performance

- Replace compliance-based directives with simple, well-defined performance measures.
- Eliminate DOE approval of labs' internal procedure documents.
- Eliminate DOE approval of individual transactions (e.g., in procurement and compensation).
- Base audits and appraisals on serious risk.
- Eliminate duplication of audits, appraisals, and reviews.
- Reward success with decreased oversight.

Operate labs according to industry-wide regulatory standards

- Eliminate DOE self-regulation.
- Shift regulatory oversight and inspection functions to responsible federal agency.
- Eliminate these functions in DOE and reallocate resources.

Consolidate roles of DOE oversight offices

- Consolidate fragmented headquarters safety roles and responsibilities.
- Reduce vertical layering of responsibilities for general lab oversight.
  - Delegate oversight to one contracting office per lab, with a well-defined, limited scope of authority.
- Consolidate or eliminate field offices, at least.

Apply rational, consistent business management principles

- Institute a multiyear budget process, for both authorization and appropriation.
- Standardize DOE's budgeting and financial reporting requirements across program **offices**:
  - Offices have different criteria for schedule, format, type of budget data, or type of cost reporting.

  - Cross-cut budgeting should be examined for appropriateness.
- Empower labs to establish long-term supplier relationships.
- Empower labs to locally determine "color of money", except for Congressional mandates.

Manage lab infrastructure in a responsible fashion

- Re-establish a strong, well-defined landlord function, with one landlord per lab.
- Consolidate funding sources for infrastructure maintenance and improvement with each lab's DOE landlord.
- Initiate a multiyear "get well" program for labs' infrastructures.

Challenge labs to reduce costs

- Allow the quality management programs to become fully applied without outside interference.
- Strengthen overhead-control efforts.
- Outsource work based on good business practice for each site.
- Re-engineer administrative processes to fully exploit benefits of modern information systems.

Other

- Simplify CRADAs much more.

Appendix C: Terms of Reference

Terms of Reference
Secretary of Energy Advisory Board Task Force on Alternative Futures for the Department of Energy National Laboratories

Overview

The 1990s are a period of substantial change for the Department of Energy's (DOE) nine multi-program National Laboratories, particularly the Department's three nuclear weapons laboratories. Sweeping geopolitical changes, limitations on nuclear weapons testing, increased attention to economic competitiveness, and the continuing demands of energy development and environmental quality--all within the context of tight federal budgets--are but a few of the factors that confront the DOE laboratories with challenges and opportunities for the future.

The purpose for establishing the Advisory Board Task Force on Alternative Futures for the DOE Laboratories is to carefully examine options for change within these laboratories and to propose specific alternatives for directing the scientific and engineering resources of these institutions toward the economic, environmental, defense, scientific, and energy needs of the nation. The Task Force should focus its initial efforts on developing a comprehensive and current understanding of the facilities, resources, core competencies, activities, and missions of the Department's multi-program national laboratories, both as individual institutions and as a system. The Task Force should also develop an early understanding of the national defense requirements that necessarily will play a major role in shaping the configuration of the defense laboratories for years to come, and should closely examine the unprecedented recent growth in collaborations between DOE laboratories and the private sector.

Once a fundamental understanding of these matters has been established, the Task Force should broadly explore critical issues facing DOE's multiprogram laboratories (and single-program laboratories, as deemed appropriate) and should examine alternative scenarios for future utilization of these laboratories for meeting national missions. Among the alternative scenarios, the Task Force should specifically address options involving the possible redirection, restructuring, and/or closure of elements of the DOE laboratory system. The Task Force should identify the costs and benefits to the nation of various alternative futures for the DOE multiprogram laboratories, and within one year (January 1995) should report these assessments along with recommendations, as deemed appropriate.

Objectives

1. The Task Force should develop a clear understanding of the roles played by the DOE multi-program laboratories in the research and technology development process. Specifically, the Task Force should examine the roles of the laboratories in meeting public missions, in serving as an R&D provider to other agencies and the private sector, and in working with academia to advance fundamental science. This examination should include an assessment of the contribution of the DOE laboratory system to the overall national investment in science and technology, and a comparison of the activities of the DOE laboratories to the R&D focus of other government agencies, academia, and the private sector.

2. The Task Force should become well versed with the nuclear weapons-related research, development, testing, and evaluation (RDT&E) needs for the nation over the coming decade, and the options for satisfying these needs. Specifically, the Task Force should closely examine the strategic planning efforts currently underway within DOE Defense Programs, particularly those efforts aimed at shifting the nuclear weapons safeguards program from underground nuclear testing to science-based stockpile stewardship.

3. The Task Force should examine the current configuration of nuclear weapons RDT&E activities among Los Alamos National Laboratory, Livermore National Laboratory, and Sandia National Laboratories. This should include an assessment of the strategy behind the current configuration, which involves purposeful redundancy to promote competition and peer review. Alternatives to the existing configuration should be examined.

4. The Task Force should assess the role of the National Laboratories in supporting economic competitiveness and contributing to the U.S. industrial R&D base. This should include an examination of the opportunities and the mechanisms for the National Laboratories--as a system--to contribute to large partnerships with the private sector.

5. With a current assessment of the roles and missions of the DOE multiprogram laboratories in mind, the Task Force should examine several options for the future of these institutions in terms of budgets, management, and mission assignments, including an analysis of possible costs and benefits of each alternative. As part of the examination of costs and benefits, the Task Force should assess the ability of R&D institutions such as the DOE laboratories to adapt to varying levels of change. This analysis should assist the Task Force in recommending implementation options.

Acknowledgments

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Alternative Futures for the Department of Energy National Laboratories

Volume II

White Papers Prepared by
The Department of Energy

for the

Task Force on Alternative Futures
for the Department of Energy Laboratories
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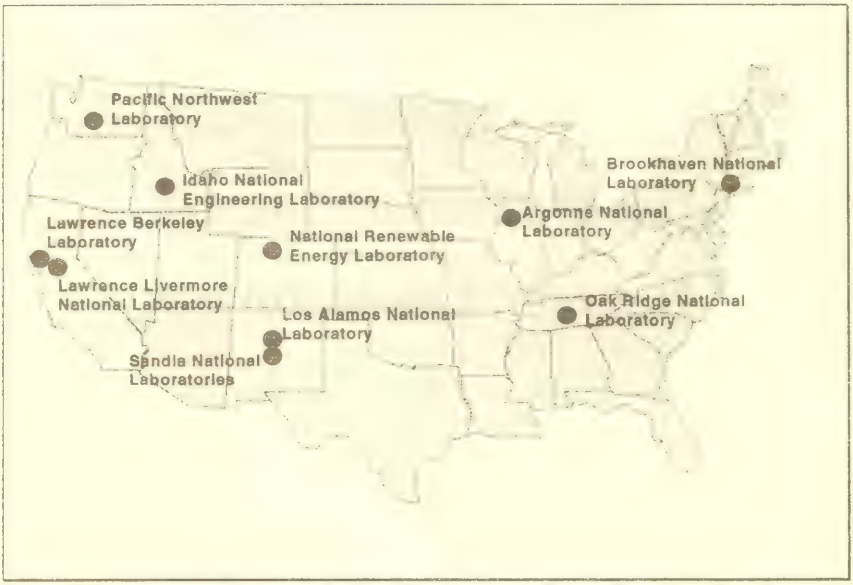
Pacific Northwest Laboratory
Idaho National Engineering Laboratory
Lawrence Berkeley Laboratory
Lawrence Livermore National Laboratory
National Renewable Energy Laboratory
Los Alamos National Laboratory
Sandia National Laboratories
Argonne National Laboratory
Brookhaven National Laboratory
Oak Ridge National Laboratory

Figure 1. Department of Energy National Laboratories Under Consideration by the Task Force

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I. Serving National Needs: An Overview of the DOE Laboratories

A. Introduction

The Department of Energy (DOE) manages the largest laboratory system of its kind in the world. With origins in the Manhattan Project, the DOE laboratories have evolved over the past 50 years to become a major component of the nation's infrastructure for maintaining U.S. leadership in scientific discovery and knowledge generation. Programs conducted at the Laboratories have consistently challenged our basic understanding of the world around us and driven new fields of scientific inquiry and technology development.

Contributions from the Laboratories in the future will help meet the National goals of environmental quality through clean energy sources and pollution-prevention technologies; enhanced security through continued reductions in the nuclear threat; continued leadership across the frontiers of scientific knowledge; and a growing economy fueled by technology innovations that open new markets, increase U.S. industrial competitiveness, and create high-skill. high-wage jobs for American workers.

The most valuable assets which the DOE Laboratories have brought to their mission assignments in the past -- and which will be dedicated to future missions -- are their human and physical resources. These assets are characterized by interdisciplinary teams with the skills to tackle national problems of great complexity and scope, and sophisticated and often unique scientific facilities that enable researchers to explore new scientific frontiers, to model and simulate processes and solutions to problems, and to achieve new understandings of how the world works and how technology can better address national needs. These resources have helped train generations of scientists and technologists who have carried the capabilities of the Laboratories to industry and academia.

Innovations and capabilities from the DOE Laboratories are behind innumerable technological achievements that have affected the nation's security, environmental quality, knowledge base, prosperity, and quality of life. Examples include:

- Development of the world's first nuclear explosive in a span of 28 months, from the date when the first scientists arrived at Los Alamos National Laboratory in 1942 until the first nuclear test in 1945. The scientists involved in this historic technological development are widely viewed to have been some of the most brilliant of the 20th Century. Their achievement required the collective efforts of physicists, chemists, mathematicians, metallurgists, engineers, and many other specialists -- a multi-disciplinary heritage which has been a hallmark of the Department of Energy laboratory system ever since.

- Development and continuous refinement of increasingly sophisticated computers. From the Univacs of the 1950's to the supercomputers of today, the Department's laboratories have been a test-bed for the first model of nearly every new top-end computer. Driven initially by defense and fusion applications, these systems now are employed at the laboratories for applications including global climate modeling; human genome research; designing next generation, fuel-efficient automobile engines; and modeling groundwater contamination.

- Technology breakthroughs in essentially all forms of energy sources and energy-efficiency technologies, including, for example, the original work on nuclear reactors; development of enhanced methodologies for oil and gas exploration; creation of new battery technologies for electric vehicles, new substrates for photovoltaic panels, and new energy-efficient window and building technologies; and advances in the development of fusion energy as a potential major future energy source.

- Original development of the field of medical isotope production and utilization. Laboratory research reactors currently are the sole source for californium-252, a radioisotope that has proven very effective in the treatment of certain cervical and brain cancers that are otherwise incurable. Other medical isotopes produced by Laboratory facilities are used for measuring bone loss in women (gadolinium-153), evaluation of coronary heart disease (potassium-43), treatment of prostate cancer (palladium-103), treatment of arthritis (tungsten/rhenium-188), and positron-emission tomography (germanium-68).

The scientists at the Department of Energy laboratories have served as invaluable consultants, experts, and hired researchers to the Government at-large throughout the past 50 years. For example, scientists of the DOE laboratories.

- Assisted the International Atomic Energy Agency with the physical inspections of Iraq's suspected nuclear and chemical weapons facilities.

- Provided a major advance to astronomical sciences with the design and prototype of the world's most powerful optical instrument, the Keck Telescope, which can peer 15 billion light years into space.

- Worked with the Department of Defense and United States intelligence agencies to determine possible sources of smuggled plutonium.

- Developed for the United States Army tank armor which achieved unheralded levels of survivability during the Persian Gulf war.

- Developed for the Department of Transportation a sophisticated computer model which can map commuter traffic to an unprecedented level of refinement, enabling new levels of transportation planning and air pollution studies.

- Developed for the United States Navy the nuclear reactors which have fueled U.S. ships and submarines for more than 100 million miles without an accident or a reactor failure.

These examples of laboratory activities illustrate the enormous variety of research underway within the confines of the Department of Energy laboratories. They also indicate the extent to which these laboratories truly are national assets -- serving national needs which extend far beyond the traditional mission boundaries of the Department of Energy. Although the Department of Energy laboratories had their origins in the Cold War, and their growth was fueled considerably by national security requirements, the resources of these facilities now are available for a much broader application to national needs. The existence of this national science and technology asset is one of the enduring legacies of the Cold War. Optimizing the utilization of these laboratories toward meeting the national security, energy, environmental, and economic needs of the future will be among the nation's major challenges -- and opportunities -- in the post Cold War world.

B. Who We Are

The Department of Energy laboratory system consists of 30 laboratories in 16 states, with combined budgets exceeding $6 billion and a scientific and technical staff which numbers close to 30,000. These facilities range from small, specialized laboratories with annual funding of less than $5 million per year, to large, diversified laboratories with annual operating budgets exceeding $1 billion. Nine of the major laboratories are "multi-program" laboratories, receiving funding from several different programs within the Department. Collectively, the laboratories are the major operational arm of the Department, performing much of the research and development which Congress directs the Department to perform through authorization and appropriations bills.

The Department of Energy Laboratories initially were established to direct the nation's efforts both in nuclear weapons and the peaceful use of nuclear energy, including nuclear power and later nuclear medicine. They also were given the mandate to support fundamental research in high energy and nuclear physics. In pursuing these objectives, the scientists and engineers at the National Laboratories explored scientific and technical boundaries across a range of disciplines, including materials science; advanced mathematical and computing techniques; frontier areas of physics, chemistry, health and environmental sciences, and geology; as well as newly emerging areas such as environmental impact assessments, systems analysis, and innovative engineering design. Today, the workforce of the National Laboratories displays a depth and breadth of scientific and technical competency found in very few institutions anywhere in the world.[1]

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[1] See Section IV "Core Technical Capabilities of the DOE Laboratories" for additional information on budgetary and workforce levels across the major technical competencies of the laboratories

The Department of Energy Laboratories are government-owned, but are operated by private contractors selected from industry, academia, and university consortia. This government-owned, contractor-operated (GOCO) approach to laboratory management began in the 1940's to meet pressing wartime needs, and today provides flexibility in the assignment of resources and facilitates quick responses to a wide variety of program needs. This approach enables private sector and university-based R&D management experience to be brought to bear on government work. The GOCO system has offered significant advantages in attracting and retaining world-class scientists and achieving scientific excellence.

In recent years, the GOCO system has been the subject of significant concerns regarding administrative and business management issues.[2] At the same time, however, there has been a growing recognition that the GOCO approach utilized by the Department of Energy had resulted in generally superior technical performance than is found at government-owned, government-operated (GOGO) facilities.[3]

The quality of scientific performance demonstrated at the Department of Energy laboratories can be measured in many ways, including numbers of technical accomplishments; scientific awards and peer recognition; patents, licenses, and commercialized technologies; and satisfied customers. In each of these areas, the success of the DOE Laboratories has been strongly validated. For example:

- Since the inception of the DOE Laboratory System, 31 scientists associated with the Laboratories have won Nobel prizes; of that number, 18 performed research as Laboratory staff and 13 employed Laboratory facilities in their award-winning discoveries.

- The Department of Energy has received more "R&D 100" awards than any other institution. This award is given annually to technology innovations (both from the public and private sectors) which hold a strong prospect for commercial success. Approximately 500 licenses are awarded annually for technologies developed at the Laboratories.

- More private sector companies seeking opportunities for technology development and research assistance are referred each year by the independent National Technology Transfer Center to the Department of Energy Laboratories than to any other federal institution.

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[2] In response to such concerns, the Department in 1993 launched a major contract reform initiative aimed at preserving the attributes of GOCO management while addressing acknowledged deficiencies which had been experienced primarily at the Department's GOCO weapons production facilities.

[3] The Defense Science Board in 1987 proposed that some of the Department of Defense laboratories be converted from government-owned, government-operated (GOGO) labs to GOCOs. The Office of Technology Assessment and National Academy of Sciences also have made recommendations that the GOCO model be seriously considered for DOD's laboratories.

- The Department of Energy laboratories perform more work for other federal agencies than does any other government laboratory system. The high volume of so-called "work for others" conducted by the Department of Energy laboratories -- nearly 20 percent of the entire funding which goes to the National Laboratories -- is a strong indication that the Department is successfully meeting the needs of other federal customers.

C. What We Do

The Department receives direction from Congress and the President to meet specific mission and programmatic objectives in areas ranging from alternative engine research to nuclear weapons dismantlement to nuclear waste clean-up to development of solar energy. Approximately 40 percent of the Department's overall $19 billion budget supports work performed at the Laboratories. The balance of the DOE budget supports researchers in academia, cost-shared research directly performed in industrial laboratories, the DOE weapons production/dismantlement complex, contractor support for environmental clean-up, the Energy Power Administration, and departmental operations.

Congress provides specific direction regarding how and where much of the Department's budget should be spent. In R&D areas, DOE program managers are responsible for establishing programs and determining where the best performance will be achieved for meeting programmatic goals in the Department's major mission areas of energy, basic science, national security, and environmental stewardship. Systematic planning and program reviews, including by independent advisory boards and peer review panels, serve as essential inputs for program development and funding decisions. Partnerships between the Laboratories and academic and industrial institutions are established as a means of helping meet the mutual goals of all parties. In addition, the Laboratories perform more than $1 billion in work for other government agencies.

1. Energy: Programs that Drive the Economy

The Department of Energy was formed, as a successor to the Atomic Energy Commission and the Energy Research and Development Administration, in response to the oil embargo and energy shortages of the 1970s. Contributing to the nation's energy security through creation of flexible, clean, efficient, and equitable energy supply and end-use technologies remains a major national challenge. U.S. consumers spend $450 billion annually on end-use energy commodities such as electricity, gasoline, and natural gas, and we spend $45 billion annually on imported oil. Although energy fuels growth, development, and improved standards of living, its use is one of the major contributors to the world's environmental problems, including urban air pollution, acid rain, and global climate change. As a result, environmentally-sound energy technologies such as renewables represent a major international need, one of the biggest emerging market opportunities worldwide, and thus a strong focus for the Department of Energy and its Laboratories.

Energy Efficiency R&D Has Saved Billions

Since the mid-1970's, a cumulative $70 million investment by the Department of Energy in energy efficiency programs at Lawrence Berkeley Laboratory has helped to spawn a $2.5-billion annual U.S. market for four particular technologies and services: high efficiency windows, high-frequency fluorescent lamp ballasts; residential equipment efficiency standards; and computer tools for energy-efficient building design. As of 1993, this R&D investment has resulted in $6 billion in energy savings, an amount that will grow to $20 billion over their entire service life (with net return on investment for consumers of $10 billion). The advances in window technology drew upon a wide variety of Laboratory strengths as teams of research architects and thin film material scientists worked with physicists and engineers with an understanding of solar and indoor radiation, the reflective and adsorptive properties of materials, and the technology for manipulating these materials for enhanced performance.

The National Laboratories have contributed significantly to boosting energy efficiency performance of commercial and residential windows, lighting, and appliances; developing cleaner-burning fossil-fuel technologies; developing nuclear reactors and enhanced nuclear reactor safety; improving efficiency and reducing CFC emissions from air conditioning and refrigeration systems; heightening the efficiency and effectiveness of oil drilling and recovery operations; and reducing the energy necessary to make important industrial chemicals. Together, these advances are resulting in billions of dollars worth of energy savings annually. (see box) The DOE laboratories conduct about $800 million of energy technology R&D annually.

2. Basic Research: World Leadership for Science, Mathematics and Engineering

The Department of Energy Laboratories have a rich science and technology base and a tradition of pursuing knowledge at the absolute frontiers of science. As a result, many major scientific accomplishments, from the subatomic to the cosmic scale, trace their roots to research conducted at the DOE National Laboratories. Large and unique world-class research facilities have enabled scientists to probe the fundamental building blocks of nature, decipher the forces of molecular biology, survey the surfaces of all forms of materials, and explore developments of the universe tracking back to the Big Bang.

Through the development and operation of particle accelerators for high-energy physics, the Laboratories have pioneered the development of powerful synchrotron radiation sources[4] for materials, chemical, and life sciences research. These facilities host large research programs involving thousands of academic, industrial, and government investigators. Research interests range from mapping the structure of materials' surfaces to visualizing the interior surfaces of arteries.

The Laboratories also operate facilities that utilize powerful beams of neutrons for studying materials such as the liquid crystals used in portable computer displays, metals and semiconductors used in electronics, industrial polymers, structural studies of biomolecules, and high-temperature superconductors. Virtually everything now known about certain vital characteristics of materials that are strong candidates for superconductivity comes from neutron scattering studies performed at the DOE Laboratories. These materials may revolutionize transportation and telecommunications.

Scientific inquiry at the Laboratories has proceeded along pathways that have resulted in developments that could never have been anticipated. Radioisotope separation science in the 1940s, for example, sparked the field of nuclear medicine, which today affects the lives of millions of people annually through cancer treatment and other radioisotope examination and treatment procedures. Studies into the causes and effects of radiation damage in reactor materials led to toughened structural ceramics for advanced diesel engines and gas turbines. And the combination of sophisticated computational capabilities and research in molecular biology at the Laboratories resulted in the development of the Human Genome program. This program has now grown into an international effort to map and sequence the entire human genome, which comprises three billion DNA base pairs. Deciphering the human genome, literally the blueprint for life, will provide unparalleled insight into the molecular basis of the thousands of genetic disorders that afflict humans -- providing the foundations for innovative medical diagnostics, genetic counseling, and ultimate mitigation of these disorders.

DOE laboratories have been instrumental in advancing entire fields of scientific research, including high energy and nuclear physics, plasma physics, nuclear medicine, nuclear engineering, supercomputing, and global climate research. Other examples include systems ecology founded on energy and nutrient studies using radiotracers, bioenergetics to trace the pathways of plant photosynthesis, and animal metabolism using related radiotracer techniques. The Department of Energy Laboratories perform approximately $3 billion in basic and applied R&D annually.

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[4] Synchrotron light sources utilize powerful beams of x-rays and ultraviolet radiation for conducting state-of-the-art structural studies. Synchrotron radiation initially was derived as a by-product of electron accelerators built for physics research. The results showed such high promise that later accelerators were built expressly to produce synchrotron radiation for materials research.

3. National Security: Reducing Nuclear Danger

National Security R&D in the Department of Energy is dedicated primarily to nuclear weapon activities, including:

- Science-based stewardship of the nuclear weapons stockpile;
- Support of nuclear weapon dismantlement and drawdown of U.S. and former Soviet stockpiles to their negotiated START II levels; and
- Development of technologies to help discourage and prevent the proliferation of weapons of mass destruction.

The nuclear weapons R&D program provides the science and technology infrastructure, including technical expertise and facilities, required to support a broad spectrum of DOE Defense Programs activities, which include design, engineering, prototyping, testing, and evaluation of nuclear weapons; supstockpile management; weapons dismantlement; arms control; and nonproliferation. Stockpile stewardship involves quality assessment and engineering, stockpile surveillance, and an independent nuclear safety assessment function.

Major thrusts in the nuclear weapons R&D program include: developing advanced predictive capabilities and above-ground experimentation facilities in light of the existing nuclear weapons test ban and developing advanced manufacturing technologies to provide a smaller and more efficient weapons production complex in response to decreasing defense budgets. These activities all rely upon the weapons R&D base, including a sustained competency in nuclear weapon design, for their successful accomplishment.

The three multiprogram defense laboratories work closely with DOE's production complex to design safe and efficient dismantlement processes. Automated processes using robotics and computer modeling are being developed by the laboratories to safely and cost-effectively handle the dismantlement of up to 2,000 weapons per year.

Assisting Russia and other former Soviet republics in reducing the size of their nuclear weapon stockpile is an important part of this activity. The laboratories are involved in several agreements with Russia for collaboration on the safety, security, and dismantlement of nuclear weapons of the former Soviet Union, and also assisting Russia in planning for the disposition of nuclear weapons-grade materials. Reducing the threat of nuclear weapon proliferation requires competence in nuclear technology and comprehensive and effective cognizance of international weapons developments.

The National Laboratories conduct some of the nation's premier research, development, and analysis for intelligence, proliferation detection, arms control, and verification technology. The Laboratories have developed instrumentation to verify compliance with the Limited Test Ban Treaty, the Nuclear Nonproliferation Treaty, the Intermediate Nuclear Forces Treaty, and the Strategic Arms Reduction Treaties (START). The Laboratories perform more than $2 billion in national security research and technology development directly for the Department of Energy, as well as nearly $1 billion in additional defense-related work for the Department of Defense.

4. Environment: Stewardship and Prevention of Waste

DOE is committed to cleaning up the environmental legacy of its past activities (mainly from the nuclear weapons program), preventing or minimizing new waste production, and assisting in the development of energy-efficient pollution prevention technologies for transportation and industrial applications.

Most of the actual cleanup work of environmental waste sites associated with the nuclear weapons production complex is conducted by private contractors, but the National Laboratories are actively involved in the technology development work necessary to help drive down the future costs of radioactive and chemical waste clean-up. Successes include radioactive waste isolation techniques, waste-shipment standards, and the use of genetically engineered organisms that consume waste or that emit light to show researchers when, where, and at what rate waste is being consumed.

Over the years, the labs have expanded their focus on waste clean-up and prevention to include broader environmental issues, such as nutrient cycling through various ecosystems, assessment of the acid-rain cycle, and examination of the effects of different types of power plants on the environment. The laboratories have worked on a range of technologies and manufacturing processes aimed at reducing or eliminating pollutants. Major accomplishments have been made in developing environmentally conscious manufacturing techniques for semiconductor manufacturing, including the development of a technique which enables companies to completely eliminate of the use of CFCs during semiconductor manufacturing. This development alone is expected to eliminate approximately 18,000 tons per year of CFC usage by the year 2010 and decrease energy use by 1.8 trillion Btu per year by the year 2010. The further development of technologies that integrate energy, environment, and economic considerations with the goal of contributing to sustainable economic development is a growing focus for laboratory activities. The Laboratories perform about $1.2 billion in environmental research and technology development annually.

5. Technology Partnerships: Enhancing National Competitiveness

During the past five years, spurred in large part by Congressional legislation adopted during the 1980s which promotes technology transfer[5], the National Laboratories have made considerable progress in teaming with industry in technology partnerships. During this period there has been a considerable evolution in thought about the role of the National Laboratories in contributing to economic competitiveness. Ten years ago, many in industry viewed the National Laboratories as "technology warehouses" that contained uncommercialized commodities ripe for transfer. Others saw the Laboratories as institutions that were inaccessible or had little to offer. These views often resulted in false expectations, disappointments, or missed opportunities.

Over the past several years, however, technology transfer has come to be characterized by a sophisticated set of partnerships between the Laboratories and industry, with clearly defined expectations and mutually-crafted R&D agendas. These partnerships have been growing at an unprecedented pace, with more than 1000 cooperative research and development agreements established between industry and the Laboratories during the past four years.

Through these partnerships, the Laboratories have begun to earn industry's trust, confidence, and support, and the Laboratories are acquiring new insight into the challenges faced by industry in technology maturation, product development, and manufacturability. As the next section describes, technology partnerships are not so much a mission area of the Laboratories, as they are a mode of operation. Increasingly, throughout the Laboratory system, partnerships with industry; academia; and state, local and other federal government agencies are the means of best meeting the research objectives established for the Laboratories. Through such partnerships, the expertise and resources of the Laboratories are teamed with those of other complementary institutions in a fashion that can shorten the time between basic scientific discoveries and product developments, and -- in the process -- strengthen the Nation's leadership position in economic growth, scientific advance, and technological innovation.

6. Science and Engineering Education and Training

The Laboratories offer a compelling environment and opportunity for helping educate and train students in science and engineering. Tens of thousands of students frequent the Laboratories annually for "hands-on" experiences that complement classroom education and contribute to the Nation's future supply of skilled scientists and technicians. The Laboratories sponsor post-doctoral fellowships and other research fellowships for hundreds of top-ranked graduate students annually, and many Laboratory personnel hold joint appointments at universities -- where they bring to their profession as educators the experiences drawn from their profession as government researchers. Through programs at all of the Laboratories, these National scientific assets are being put to use to assist in the education and training of students at the frontiers of science and technology. These facilities also have been used to help train thousands of teachers in the best techniques for presenting science and technology in the classroom.

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[5] The 1980 Stevenson-Wydler Act required the Department of Energy to establish technology transfer as an explicit mission of its laboratories. Subsequent amendments to that act, in the form of the 1986 Federal Technology Transfer Act and the 1989 National Competitiveness Technology Transfer Act, gave the Department and its Laboratories and facilities additional authority and mechanisms for working cooperatively with industry.

D. How We Do It

If there is one word that best describes how the Department of Energy laboratories execute their mission assignments, it is integration -- of scientists and engineers into multi-disciplinary teams; of basic science, applied science, and technology development into a holistic approach to problem-solving; and of complementary skills and perspectives from the federal government, academia, and the private sector to the mutual benefit of all parties. And if there is a single explanation for the ability of the laboratories to achieve such integration, it lies in the breadth and depth of core technical capabilities which form the set of skills which the laboratories exercise in pursuit of their mission assignments.

a) Scientific Facilities and Multi-disciplinary Workforce

By virtue of several decades of investment by the Nation in the Department of Energy laboratories, these institutions currently exhibit a combination of physical and human R&D assets not duplicated anywhere in the world. The replacement value of the physical R&D assets at these laboratories exceeds $30 billion, and includes facilities such as:

- One of the world's premier assemblages of high-performance computing centers, including many of the world's most powerful scientific computers, which serve as a fundamental tool for helping meet essentially all of the missions of the laboratories and which are setting the stage for broad utilization of massively-parallel computers in the future;

- The world's largest laser system, which is being utilized to simulate conditions within nuclear weapons, to advance our understanding of the universe, and to explore options for creating fusion energy;

- Two of the world's most powerful particle accelerators, which are being used to discern the fundamental building blocks of nature;

- Three of the nation's most sophisticated facilities for mapping the human genome;

- Three of the world's most powerful neutron sources (two reactors and one accelerator), which provide the means for materials characterization and medical isotope production, and environmental analysis;
- One of the world's leading tokamak reactors for studying fusion plasmas, which has produced the most power ever in controlled fusion energy experiments;
- Three of the world's premier X-ray radiation sources, which are being tapped for materials research in areas ranging from structural biology to designing integrated circuits to developing new industrial chemicals; and
- Major and unique facilities for studying combustion, solar thermal generation of electricity, photovoltaic cells, energy efficient lighting and window systems, nuclear reactor safety, energy utilization for construction materials and building technologies, and semiconductor reliability.

These are but a few examples of the research assets housed within the Department of Energy laboratories. Yet, even a partial listing such as this speaks volumes about the capacity of these labs to probe new frontiers of science, to work with industry in new areas of technology development, and to deliver scientific and technological progress in meeting important national needs. The full inventory of the major R&D assets at these labs would comprise a very long list, but in-and-of-itself would not paint a full picture of the means by which the Department and its laboratories execute their missions. This is because the facilities themselves are of little value without the trained workforce which, in many cases, designed and built the facilities, and which now operates them in the pursuit of scientific and technological advance.

The Department of Energy laboratories support an extraordinarily broad collection of scientists and engineers, with established -- and in many cases world-class -- expertise in areas including physics, chemistry, mathematics, computer science, engineering, materials science, biology, earth sciences, environmental science, metallurgy, and systems engineering. No other federal laboratory system has the ingredients of such a multi-disciplinary environment as exists within the Department of Energy laboratories, which is one of the reasons why these labs represent such a distinctive national asset.

b) Core Technical Capabilities

The facilities and trained workforce of the Laboratories can be presented in the context of eight major core technical capabilities, which together represent generic areas of expertise which enable the Laboratories to address their missions. These core technical capabilities are:

- Advanced Materials, Synthesis and Characterization
- Advanced Computing, Modeling and Simulation
- Advanced Manufacturing and Processes Technology
- Bioscience and Biotechnology

- Nuclear Science and Technology, High Energy and Nuclear Physics
- Advanced Energy Technologies and End Use Applications
- Environmental Science and Remediation Technology
- Integrated Defense Science and Technology

In addition to these major areas of expertise which are characteristic of the entire Laboratory system, individual laboratories within the system also have important and unique core capabilities, such as in laser and electro-optics, sensors and instrumentation, electronics, and neutron-based science. These additional strengths supplement the total resource represented by the Laboratory system. Each of these core capabilities depends upon multi-disciplinary skills drawn from the workforce of the Laboratories. Collectively, these capabilities provide the means by which the Laboratories solve complex problems assigned by the Department; respond to new challenges and requests for assistance from other government agencies, academia, and the private sector; and generally move ideas from concept to reality -- either through the generation of experimental results or development of new technologies and operational systems.

c) Integrated Approaches to Problem Solving

The combination of a pervasive problem-solving culture at the Laboratories, and the broad and diverse technical skills and core capabilities resident within the Laboratories, provide the ability for these institutions to address national issues in an integrated fashion -- through multi-disciplinary teams; through integration of basic science, applied science, and technology development; and through collaborative efforts with researchers from academia, industry, and other government agencies.

The Laboratories are at their best in bringing teams together to address large, complex problems. Because the Laboratories are organized to solve problems in a fashion that is unconstrained by the boundaries of traditional academic disciplines, they have a multi-disciplinary operational approach that is distinctive from the single-discipline methodology which remains generally characteristic of academia. In addition, because many of the problems assigned to the Laboratories are of a high-risk, long-term nature, the Laboratories generally have a different orientation than found in industrial laboratories, where near-term market forces are of paramount consideration. Yet, the Laboratories, because of their unique human and physical assets, have served as a catalyst for developing teams of government, academic, and industrial researchers. In this fashion, complementary strengths of researchers from varying perspectives are brought to bear on problems of common interest. Examples of integrated approaches to problem solving include:

- ***National Oil Technology Partnership:*** This effort involves all nine multi-program laboratories in partnership with the petroleum industry. Nineteen projects currently are underway in such diverse areas as seismic fracture detection, synthetic diamond drill bit development, and failure analysis of extraction devices. This partnership spawned an entirely new market in diamond drill bits and has yielded tens of millions of dollars in savings to petroleum companies.

- ***The American Textiles (AMTEX) Partnership:*** This effort involves ten of the Departmental Laboratories and a consortium of five nonprofit research, education, and technology transfer institutions representing the vertically-integrated American textile industry. The projects involve Laboratory strengths in advanced materials and processes, energy efficiency, waste minimization, information systems, and automation, in an effort to improve the competitiveness of the U.S. textile industry, from fiber through finished product.

- ***The U.S. Advanced Battery Consortium (USABC):*** This effort links the Department of Energy Laboratories, the "Big Three" automobile manufacturers, and the utility-supported Electric Power Research Institute, for the purpose of developing advanced batteries for electric vehicles that will both perform like present internal-combustion engine vehicles and satisfy various state mandates for zero-emission vehicles. This cost-shared partnership takes advantage of Laboratory strengths in advanced materials, energy systems, manufacturing, and diagnostics.[6]

- ***National Center for Advanced Information Components Manufacturing:*** This partnership involves the Advanced Research Projects Agency of the Department of Defense, the Department of Energy, and industry in the development of advanced electronics technologies, such as flat-panel displays. The effort draws on Laboratory strengths in manufacturing, computation and simulation, and electronics. Funding for the Center is provided by ARPA and supports research teams from the Laboratories, industry and academia.

- ***The PHENIX Detector:*** This large, nuclear physics detector will serve as a central data-gathering instrument for a major new particle accelerator at the Brookhaven National Laboratory. Construction of the detector involves approximately 360 scientists and engineers located at five Department of Energy Laboratories, 15 U.S. universities, and 21 foreign institutions and universities. This detector will examine nuclear matter which will be at some of the most extreme conditions of temperature and density ever achieved in a laboratory -- conditions that probably have not existed in the universe since the Big Bang. Construction of PHENIX draws on Laboratory strengths in nuclear physics; the design, development, and construction of large-scale research facilities; systems engineering; sensors and instrumentation; and advanced computation, modeling, and simulation.

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[6] The Laboratories also are major players, in collaboration with the "Big Three" auto manufacturers and other agencies, in the Partnership for New Generation Vehicles, an R&D effort aimed at developing a new generation of vehicles that will be three times more energy-efficient than today's cars.

- ***Superconductivity Partnership Initiative:*** This joint Department of Energy-industry effort, involving research centers at three of the Laboratories, has helped pioneer the fabrication and application of new high-temperature superconducting materials. Such materials, which conduct electricity with minimal resistance, hold the potential for widespread applications in areas ranging from appliances and electronic devices to medical imaging to power transmission and magnetic energy storage. Drawing on Laboratory expertise in advanced materials and processing, energy systems, advanced computing, and condensed matter physics, the centers are playing an important role in keeping U.S. industry competitive in the global race to develop superconductivity technology.

- ***Atmospheric Radiation Measurement Program:*** This DOE Program integrates the resources of eight DOE labs, 13 other federal laboratories, more than 20 leading research universities, and foreign and private enterprises to address critical elements of the United States Global Change Research Program. Research focuses on atmospheric radiative processes and the role of clouds, which are among the most critical needs for the improvement of climate prediction models identified by the National program. This major collaboration is resulting in a new understanding of basic climate processes and of the effects of climate on ecosystems and the evolution of natural weather systems.

These examples provide a snapshot of how the Laboratories approach problem solving through a distinguishing integration of skills, capabilities, technologies, facilities, and research performers -- including partners from throughout the Laboratory system, other federal agencies, industry, academia, and around the world. The extent of coordination, integration, and engagement between the Department of Energy Laboratories and other research performers also is illustrated by the following statistics:

- During 1993, the 60 major research and user facilities operated at the Department of Energy Laboratories were utilized by more than 9,700 scientists and engineers, representing 188 U.S. colleges and universities, 103 U.S companies, and 26 U.S. laboratories.

- During 1993, more than 20,000 scientists and engineers from industry, academia, and other government agencies worked as guest researchers at the nine multi-program National Laboratories.

- During 1993, the nine multi-program National Laboratories received more than 170,000 visitors, who frequented the laboratories for purposes such as briefings, technical discussions, and meetings.

- During 1992, the Department of Energy Laboratories had formal technology transfer partnership arrangements with more than 3,400 companies and academic institutions.[7]

- During the past four years, the Department of Energy Laboratories have entered into more than 1,000 Cooperative Research and Development Agreements (CRADAs) with more than 700 companies; the combined cost-shared value of these cooperative R&D programs exceeds $1.9 billion.

From fundamental and applied research, through design and development of applications, to process engineering and manufacturing support, the laboratories are an environment where all aspects of technology development and deployment are routinely addressed. The ability to integrate across the suite of capabilities at the laboratories explains why these institutions have become magnets for such a large number of academic and industrial researchers.

E. Looking to the Future in a Changing World

The nation faces major new challenges as a result of the end of the Cold War, growing concerns about U.S. economic competitiveness, the need to achieve sustainable economic growth and environmental quality, and the reality of stringent federal budgets. As a result of these forces, the national scientific and technological enterprise is experiencing perhaps its most significant transformation since the end of World War II. Industry increasingly is looking for opportunities to team with other R&D performers -- including former competitors -- in the development of new technologies; there is growing political pressure for all public investments to be tied more closely to national needs; the principles of total quality management increasingly are being applied throughout industry, including at research institutions; and the traditional boundaries between federal R&D agencies are giving way as the Nation seeks to provide multi-agency, coordinated approaches to satisfying National needs.[8]

Faced with these new circumstances, the Department of Energy Laboratories are changing dramatically. The defense programs at the Laboratories are undergoing a complete transformation. Partnerships between the Laboratories and industry are growing at an unprecedented pace, far exceeding available funding. The Department has instituted new contract reform measures aimed at improving management of the

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[7] These arrangements included cost-shared contracts, cooperative research and development agreements, R&D consortia, personnel exchange programs, licensing agreements, user facility agreements, and consulting agreements.

[8] The President's Science Advisor has referred to the establishment of a "virtual R&D agency," which involves utilization of the full spectrum of federal R&D capabilities in an integrated and coordinated fashion, facilitated by the National Science and Technology Council.

Laboratories. In addition, the Laboratories are working more closely together as a system than at any time in the past and are forging strong new relationships with other government agencies. These changes all suggest a general direction for the future of the Laboratories. Although the precise research agenda will emerge and evolve with time, the focus for the Laboratories in the future will be on helping meet major National needs for which science and technology play a role. The challenges include:

- ***Providing Energy Resources:*** Global population growth and expected increases in energy utilization, particularly in developing nations, create both challenges to the environment and opportunities for the provision of clean energy sources to world markets. The potential risks of global climate change will demand continued technical advances in areas such as sustainable energy technologies; efficiency improvements for fossil fuel combustion; and energy-efficient materials, manufacturing processes, and transportation systems. The development of fusion energy, hydrogen energy, and options for advanced nuclear power all must be explored as part of a National program to provide secure, reliable, and diverse energy for the future.

- ***Reducing the Nuclear Danger:*** The end of the Cold War has provided an historic opportunity to reduce global nuclear weapons stockpiles, yet the nuclear danger persists due to nuclear proliferation, potential terrorist actions, and significant quantities of weapons-grade materials and the know-how to build nuclear devices. The United States will continue to rely upon nuclear weapons for deterrence for the foreseeable future, yet these weapons must be kept reliable, safe, and secure without nuclear testing. Meeting this goal will require highly sophisticated computational modeling and simulation, as well as above-ground experimentation. The Nation will continue to need a nuclear weapons production and dismantlement complex, yet one that is substantially smaller, more efficient, and less costly than exists today.

- ***Environmental Stewardship:*** The President recently stated that "Attaining sustainable development is one of the greatest challenges facing our country and the global community -- a challenge that can only be met by developing and deploying technologies that will protect the environment while sustaining economic growth."[9] Such technologies will be required for enhanced clean-up of existing environmental problems, such as the nuclear waste legacy of the weapons production complex, as well as for designing new industrial processes, manufacturing techniques, and modes of economic activity that are resource efficient and environmentally benign.

- ***Maintaining Leadership in Science and Technology:*** The Nation has reaped enormous benefits from its investments in science and technology over the past 50 years, yet continued scientific advance -- the fuel for technology's engine -- will be essential to help solve problems such as protecting the environment, improving human health, ensuring national security, and providing continued economic prosperity. Continued exploration of scientific frontiers contributes to the nation's knowledge base and capacity for innovative solutions to emerging problems and National needs.

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[9] Technology for a Sustainable Future: A Framework for Action, The White House, July 1994, p 1.

- ***Technology Partnerships:*** Among the nation's greatest challenges for the future will be to strengthen and expand public-private partnerships aimed at technology development and enhanced U.S. industrial competitiveness. This challenge requires broad engagement among industry, federal and state governments, and academia in the development of shared visions and coordinated management strategies for accelerating innovation and technology development.

The economic, environmental, national security, and scientific challenges of the 21st Century will require collective national responses which take advantage of disparate yet complementary strengths throughout society. The Department of Energy Laboratories represent one of the major national assets available to help address emerging National needs. The Laboratories are well suited to address such challenges, precisely because of the diversity and depth of their technical capabilities. The Laboratory system has served as a versatile and valuable resource to the nation in the past, with a record of accomplishments that have expanded our understanding of the world, created new fields of science and technology, established new commercial markets, and, in the case of national security contributions, determined the course of history.

In the future, after completing their most substantive change in operating method in decades, the DOE Laboratories will be important players -- teamed with industry, academia, and other government agencies -- in the Nation's concerted effort to provide a sustainable society which provides security, intellectual renewal, and prosperity for future generations. In looking forward during a time of change, the Department of Energy and its Laboratories endorse and embrace the guidance of the President:

> ***"The challenges we face -- from our competitors abroad and from our people at home -- demand dramatic innovation and bold action that will not just revive our economy now but also ensure our economic growth well into the future. Building America's economic strength through technology demands new initiatives that confront these challenges effectively, efficiently, and creatively."***
>
> ***President William J. Clinton***
> **Technology for America's Growth,**
> **A New Direction to Build Economic Strength**

II. DOE Lab Contributions to the Nation's Scientific Enterprise

A. Introduction

On August 3, 1994, the Clinton Administration announced a new National science policy aimed at maintaining world leadership in basic science, mathematics and engineering. Titled Science in the National Interest, the policy document ranks among the most significant Presidential statements on the importance of fundamental science in the past fifty years. The Nation's investment in research and development is heralded for having produced "a scientific enterprise without peer," and our scientific strength is characterized as "a treasure which we must sustain and build on for the future."

The treasure which comprises our scientific establishment involves public and private institutions, researchers, facilities and instrumentation located throughout the Nation. The myriad laboratories and individuals -- and the American public which has provided them with federal public support -- all have reason to celebrate the historic accomplishments which our scientific enterprise has provided, at an accelerating pace, particularly since the end of World War II. We all must also confront the challenges of the future as we seek to sustain U.S. scientific excellence and work to strengthen the role of science in serving core National needs in areas such as improved health care, environmental protection, economic competitiveness, and national security.

In developing a new National science investment strategy, Science in the National Interest states that "we must reexamine every element of the enterprise" to ensure that each element is as strong as it can be given limited resources. The fundamental science portfolio of the Department of Energy (DOE), and particularly of its laboratories, represents one of the nation's major scientific assets, and appropriately should be reexamined as the Nation addresses the challenges and opportunities of a post-Cold War world.

This paper reviews the role of science and technology at the Department of Energy's laboratories and discusses the Department's contributions of the DOE laboratory system to the Nation's research infrastructure. The National goals delineated in Science in the National Interest are used as the structure for describing the contributions of the DOE laboratory system[10] in the past, and for providing recommendations aimed at achieving continued scientific excellence in the future.

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[10] The Department of Energy laboratory system includes nine multi-program, National laboratories;11 smaller, single-program laboratories; and 10 highly-focussed mission-specific laboratories.

B. Science and Technology at the Department of Energy

1. A Tradition of Scientific Exploration

The Department of Energy Laboratories have a rich science and technology base and a tradition of pursuing knowledge at the frontiers of science. As a result, many major scientific accomplishments have emerged from research conducted at the DOE Laboratories. These range from conducting pioneering work on the fundamental structure of matter to expanding our understanding of the global environment to developing technologies to map the human genome.

The construction and operation of large-scale, basic research user facilities has been one of the distinguishing characteristics of the Department of Energy. The origins of this mode of research date back to the invention of the cyclotron in 1929 by Ernest O. Lawrence in Berkeley, California. In 1931, Lawrence established what then was called the Radiation Laboratory to tackle large-scale science in an intentional and intensely multi-disciplinary fashion. To help achieve this purpose, Lawrence built a large cyclotron which was of a scale and character unlike anything that could be built or sustained within an academic setting. His laboratory was the genesis of the present Lawrence Berkeley Laboratory. The cyclotron project set the stage for the development and operation of a series of major research and user facilities which have been signature contributions by the Department's laboratories to the Nation for the past 60 years. Lawrence's work also established the multi-disciplinary approach to problem solving which has been a hallmark of the research environment at the DOE Laboratories ever since.

Among the major research facilities at the Laboratories are major particle accelerators which have effectively defined the fields of high energy and nuclear physics over the past 50 years. Through the construction and operation of a series of powerful particle accelerators, the Laboratories have discovered many of nature's most fundamental particles and revealed the forces which govern their interactions. Recent evidence of the "top quark," the sixth of nature's basic building blocks, through research at DOE's Fermi National Accelerator Laboratory exemplifies such work -- which has helped create the foundation of knowledge that underpins other fields of science.

In the 1950s, the Laboratories developed the means of utilizing a by-product of accelerator operations -- synchrotron radiation -- for exploring new frontiers in materials, chemical, and life science research. The Department's synchrotron radiation facilities (commonly referred to as "light sources") generate powerful beams of ultraviolet light and x-rays for studying materials at the molecular level. These light sources have become indispensable tools for research in areas as diverse as studying materials for integrated circuits, mapping the structure of industrial chemicals, and designing molecules for future use in pharmaceuticals.

The Laboratories also have built and operated facilities which generate powerful sources of neutrons. Because neutrons are uncharged, they can penetrate deeply into sample materials and give precise information on the positions and motions of individual atoms. The neutron research facilities of the Laboratories have provided major advances in our understanding of materials such as superconducting materials, polymers, and liquid crystals used in portable computer displays. These facilities also are a source of radioisotopes for medical, research, and industrial applications. In fact, the field of nuclear medicine and the medical use of radioisotopes trace their origins to work at the DOE Laboratories.

The Department currently operates more than 60 major research and user facilities that provide access to scientific frontiers that would not otherwise be reached for materials, medical, chemical, biological, and pharmacological research. More than 9700 scientists and engineers utilized these major facilities in 1993, representing more than a 50 percent increase over the past six years (Figure 2). Researchers using these facilities represented 278 U.S. colleges and universities, 265 U.S. companies, and 47 U.S. laboratories (Figure 3). The thousands of researchers who conduct their work at these facilities often do so in collaborative teams that combine the complementary strengths and perspectives from industry, academia and the federal government . The resultant contributions of these research performers are measured in the scores of scientific papers, proceedings, patents, and commercial products that emanate from their supporting institutions.

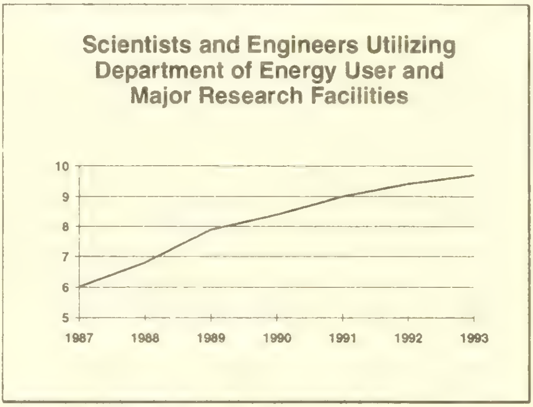

Figure 2. Utilization of Major Research Facilities

The major research and user facilities of the Department's Laboratories exist in synergy with an in-house research staff that complements, but is not necessarily dependent upon, such facilities. For example, small teams of principle investigators at the Laboratories have provided major contributions in areas such as atmospheric chemistry, microbiology, catalysis, and even cosmology. If there is one ubiquitous tool within the Laboratory system, however, it is high performance computers. From the earliest days of computers to the present, the Laboratories have been among the world's leading experts in computational science, modeling, and simulation. Initially driven by the data management requirements of national security, fusion energy, and high energy physics applications, these systems now are fully engaged by the Laboratories in National challenges including global climate modeling, designing fuel-efficient automobiles, and human genome research.

2. Science is Central to the Department's Missions

The examples listed above provide but a few illustrations of scientific and technological accomplishments of the Department and its Laboratories. However, these examples, in-and-of- themselves, do little to convey the cardinal importance of science and technology to the overall success of the Department in meeting its assigned missions. It is no understatement to say that science and technology are the most important means through which a majority of the Department's activities are conducted. This reality is made clear in the Department's May 1994 strategic plan, Fueling a Competitive Economy, which positions science and technology at the center of the Department's five major business lines -- intersecting and amplifying each mission (Figure 4).

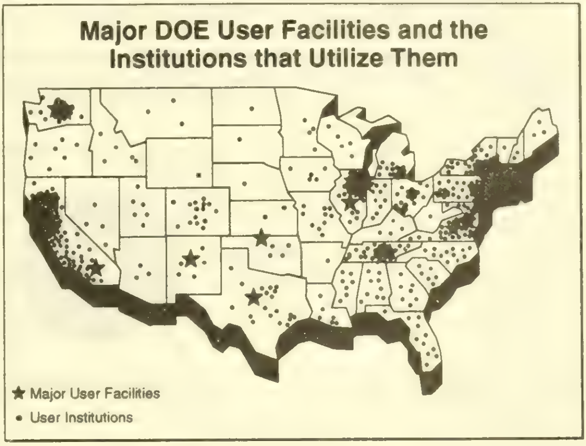
Major DOE User Facilities and the Institutions that Utilize Them
★ Major User Facilities
• User Institutions

Figure 3. Institutions Using Research Facilities

3. Program Scope and Execution

The Department's total science and technology investment for Fiscal Year 1994 was $7.3 billion,[11] amounting to approximately 40 percent of the Department's overall Fiscal Year 1994 budget of $19 billion, and 10 percent of the total federal R&D budget of $74 billion.[12] The Department's $3.4 billion funding of basic and applied research (excluding technology development, equipment, and construction) is fourth among the 16 agencies that are the primary Federal supporters of science and technology. This level follows the National Institutes of Health at $8.9 billion, the Department of Defense at $4.3 billion, and the National Aeronautics and Space Administration at $4.1 billion. The Department of Energy supports the largest federal program in materials research and funds 90 percent of the nation's research in high energy physics.

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[11] Includes research, development, capital equipment and construction of research facilities.

[12] This figure includes R&D and R&D plant operations; source: Science & Engineering Indicators-1993, National Science Foundation, National Science Board.

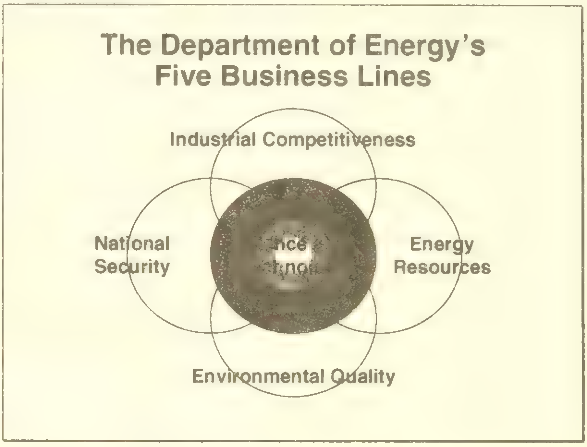

Figure 4. DOE Business Lines

The Department executes its science and technology function in many ways, including through grants to university researchers, cost-shared research programs with industry, construction and operation of major scientific user facilities, and laboratory-based research programs. For example, the Department's research program supports approximately 1800 university R&D grants totaling more than $600 million annually at more than 100 U.S. universities.

The organization and management of the Department's research programs is the primary responsibility of the Department's program managers, who develop and manage research programs in response to legislative and Executive Branch direction. These programs are executed through research performed across a range of R&D performers, sometimes including multiple universities, companies, and DOE laboratories. Through peer evaluation and program reviews, the Departmental program managers ensure that the individual tasks among distributed researchers are integrated and are contributing toward the overall research objectives of the program.

C. DOE Contributions to National Science Policy Goals

The basic and applied research programs of the Department and its laboratories fit well and fully within the goals that are stated in the August 1994 National science policy document, Science in the National Interest. This section describes current activities and past accomplishments for each of the goals delineated in the White House science policy.[13] Recommendations are also included that have been developed by the Department as a means of helping achieve these National goals.

1. Goal: Maintain Leadership Across the Frontiers of Scientific Knowledge

Through its laboratory programs, including through its major research and user facilities, the Department is engaged in scientific exploration that spans from the fundamental building blocks of matter to the far reaches of the Universe to practical applications of physical and biological science.

Research conducted at Department of Energy laboratories has excelled within its disciplines, and also has helped create entirely new fields of scientific inquiry. For example, the Human Genome Program was conceived and initiated by the Department of Energy -- growing out of its long-standing research aimed at measuring radiation-induced mutations in cells and combining that research base with the National Laboratories' exceptional computational abilities. Similarly, the Laboratories have played a major role in establishing and shaping the research agenda in high energy and nuclear physics, plasma physics, nuclear medicine, nuclear engineering, supercomputing, and global climate modeling.

Scientific excellence and leadership has earned an impressive array of scientific awards to the Department. More than 58 Nobel prize winners since 1936 have been supported by the Department of Energy at some time in their careers. Eighteen Nobel prizes have been awarded to Department of Energy laboratory employees, and another 13 to researchers who employed National Laboratory facilities in their award-winning discoveries. Most of the 40 winners of the prestigious Enrico Fermi Presidential awards have done research supported by the Department. Many additional award and distinctions have been presented to Laboratory employees for their contributions in science and technology, including from the National Academy of Sciences, Smithsonian, American Physical Society, and many other scientific organizations.

User Facilities: Creating New Windows on the World

Dow Chemical is involved in a research partnership with one of its commercial competitors, DuPont, along with Northwestern University, at the Advanced Photon Source at the Argonne National Laboratory. The three partners have joined to form a Collaborative Access Team that will conduct research on materials such as catalysts, fibers, engineered polymers, plastic and metal finishes, and electronic materials. As explained by Dow's Vice President and Director for R&D, "The Advanced Photon Source will let us look at materials in ways never before possible. It will be like seeing in color what you've only seen before in black and white."

New facilities under construction by the Department promise continued scientific discovery and world leadership. For example, new ultra-violet and X-ray radiation sources at the Lawrence Berkeley Laboratory and at the Argonne National Laboratory will enable studies of the structure of metals, alloys, ceramics, polymers, and biological molecules, such as proteins and viruses. These studies hold the potential for revolutionary advances in understanding of materials and could result in major future commercial applications in products ranging from fabrics and plastics to designer drugs and computer chips.

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[13] *Science in the National Interest* delineates five major goals for continued stewardship of the nation's basic science enterprise; for the purposes of this White Paper, the fourth and fifth goals--which both address training and education--are combined.

Although the Department's laboratories have a long record of scientific excellence, the challenge is to achieve continuous improvement during a period of scarce resources. The following strategies will help the Department contribute to the National goal of maintaining leadership across the frontiers of scientific knowledge:

- Concentrate and sustain clear areas of world-class scientific excellence.

- Maintain a proper balance between fundamental research, applied research, and technology development and demonstrations.

- Strengthen and expand utilization of peer review throughout laboratory programs to ensure the best scientific and technical performance.

- Sustain and bolster international coordination, especially when large scientific facilities are required.

2. Goal: Enhance Connections Between Fundamental Research and National Goals

The Department of Energy has major National mission responsibilities in the areas of energy resources, national security, fundamental science, and environmental quality. The Department has invested heavily in science and technology to uphold these responsibilities. Science at the National Laboratories in support of these areas is wide-ranging, encompassing both long- and short-term basic and applied research. However, in order to meet the Department's challenging goals for the future, the connections between fundamental research and mission objectives will need to be tighter than ever before.

- ***Energy Resources***: The Laboratories have played a major role in examining the fundamental behavior of materials involved in the generation and use of energy, and in studying energy production and conversion phenomena essential for future energy security. For example, Laboratory research involving crystalline silicon and thin film photovoltaic substrates have contributed to major advances in solar energy. Work by the Laboratories on basic combustion dynamics has translated into more efficient automotive engine designs. Research by the Laboratories on biochemical and thermochemical processes may ultimately pave the way for widespread future utilization of biofuels. Similarly, basic advances in plasma physics and materials science has been essential to major recent accomplishments in fusion research, which could become a major energy source in the future.

Selected Accomplishments of the National Laboratories that have contributed to U.S. Science and Technology Leadership

	High-Energy Physics
1950's	Study of cosmic rays gives way to studies of particles and their interactions leading to the construction of the world's largest accelerators, the Bevatron and the Cosmotron.
1970's	The development of the Standard Model provides the first unified theory of matter and sets the stage for all new experimental devices. US is acknowledged leader in the world, in both experiment and theory.
1990's	Discovery of the top quark at the Tevatron is imminent which will cap a 16 year international quest to complete the experimental verification of the Standard Model.
	Atomic and Nuclear Physics
1950's	Fundamental research in atomic and nuclear phenomena led to nuclear magnetic resonance and the underlying physics of the laser.
1970's	Practical high-power and semiconductor lasers developed.
1990's	Applications of lasers in communications, medicine, consumer electronics; magnetic resonance imaging for medical diagnostics.
	Biomedical Science
1950's	Research on the effects of radiation on cells and genetics,
1970's	Developed the computer axial tomography (CAT scan) and positron emission tomography (PET scan) medical diagnostic techniques.
1990's	Human genome sequencing and mapping; major advances made in structural biology.
	Materials Science
1950's	Provided the understanding of carbon composite structures which led to the extensive use of graphite-based materials. Research in radiation damage led to new materials resulting from ion implantation techniques.
1970's	Developed electron beam and laser annealing processes leading to major semiconductor manufacturing technologies. Developed fracture-resistant steels and produced the first metallic glasses.
1990's	Achieved world records in performance of: photovoltaic energy conversion; organic superconductors; superconducting wires, tapes, and devices; batteries and fuel cells. Developed flexible, polymer-based electrolytes; lead-free solder; high-temperature, high-strength intermetallic alloys; and superior welding methods. Discovered world's first magnetic polymer.
	Fusion Energy
1950's	The Atomic Energy Commission is one of the world's leaders in initiating the theoretical and experimental foundation of magnetic confinement fusion.
1970's	The Energy Research and Development Agency begins construction of the world-class Tokamak Fusion Test Reactor. The U.S. fusion program is acknowledged to be the world's leader in the field.
1990's	The Department of Energy's Tokamak Fusion Test Reactor achieves world record in controlled fusion energy production. The magnetic fusion program moves toward internationalization of its effort and transfer of its technology to U.S. industry. Inertial fusion provides the technical base for nuclear stockpile stewardship.

- ***National Security***: The nuclear weapons, arms control verification, and nuclear non-proliferation activities of the Laboratories have depended upon, and helped facilitate, a comprehensive understanding across a range of scientific disciplines, including physics, chemistry, mathematics, materials science, and computational science. With the cessation of underground nuclear testing, basic science will play an even greater role than it has in the past in providing the basis for safe and secure stewardship of the nuclear stockpile. To meet their national security missions in the future, the Laboratories will need to develop a stronger scientific base within the weapons program through enhanced computation and simulation activities, and through more advanced work in areas such as inertial confinement fusion, materials science, neutron radiography, and pulsed power. Science, and not nuclear testing, will be the foundation for maintaining confidence in the safety and reliability of our nuclear deterrent.

- ***Environmental Quality***: The Laboratories have performed a wide range of research in areas that contribute to our understanding of environmental contamination, environmental systems, and pollution prevention and mitigation. For example, the Laboratories are at the forefront of research on air pollution and its movement through the atmosphere. This work, with origins related to the study of atmospheric nuclear testing, focuses on areas including atmospheric chemistry, acid rain, stratospheric ozone depletion, and global climate change. The Laboratories have played a major role in developing increasingly sophisticated climate models and are developing the elements of a comprehensive Earth-systems model that integrates the impact of human and natural activities on the Earth's environment. Environmental research also is being performed at the Laboratories in ecosystem functioning and responses to change, bioremediation, hydrology, and health risks from low-level exposure to energy-related chemicals. These areas of research have led to the development of environmental technologies and integrated ecosystem management, and will be essential for helping meet the estimated $300 billion nuclear clean-up challenge which is a legacy of the nuclear weapons production program.

The following strategies will help the Department contribute to the National goal of enhancing the connections between fundamental research and national needs.

- Increase joint planning of research programs and technology development programs.
- Invest in research that supports the development of environmental, national security, and energy technologies.
- Examine opportunities for enhanced leveraging of the R&D base for meeting mission needs.

3. Goal: Stimulate partnerships that promote fundamental science and engineering and effective use of physical, human, and financial resources

Partnership mechanisms for working with the DOE Laboratories include consulting agreements for university professors, long-term guest assignments for industrial and foreign researchers, user programs for major facilities, cost-shared contracts, and Cooperative Research and Development Agreements (CRADAs). The first two mechanisms are particularly effective in promoting broad-based fundamental research.

Partnerships with university and industrial scientists and engineers are a central operating approach at the DOE Laboratories. This is evidenced, for example, by the more than 20,000 scientists and engineers who were guests at the multi-program laboratories in 1993; approximately one-third were from industry.[14] At the Oak Ridge National Laboratory alone last year, guest scientists and engineers numbered almost 4400, more than double the number five years earlier. Of these, 1700 were industry participants, an increase of 22 percent over the number in 1991. These guests represented the equivalent of about 1500 additional full-time laboratory scientists, effectively doubling the productive scientific workforce at Oak Ridge. Experience at the other National Laboratories is similar. These partnerships are helping the productivity and vigor of the laboratories while benefiting industry and contributing to the Nation's science and technology enterprise.

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[14] Guests are researchers who visit and work at a laboratory for a period of ten days or more. A much larger number of people (over 200,000) visit the laboratories for shorter periods of time to do research or to talk with laboratory staff, or to tour the site.

Assignments of faculty, students, and industrial scientists to laboratories generally are paid for by the supporting organizations.[15] In addition, companies invest significant funds at the laboratories in support of experimental use at user facilities, such as the Department's advanced light sources. At the National Synchrotron Light Source at the Brookhaven National Laboratory, many industrial users have spent $2 - $3 million apiece to provide the beam line equipment for their experiments. Since this equipment is of use only to the facility, it is left behind for other users when the industrial partner has completed its work. Costs for beam lines at the new Advanced Light Source and the Advanced Photon Source are substantially greater because of the greater complexity and capability of the facilities. Access to the beam lines at these new facilities has already been claimed by dozens of teams of government, academic, and industrial users. The total investment so far by industry in equipment at DOE light sources is in excess of $100 million.

The Department currently has more than 1000 CRADAs with over 700 industrial partners. While the majority of these partnerships are related to specific product or development efforts, almost 20 percent involve basic research. An even larger fraction involve work that has grown out of previously sponsored basic research. The Department and the Laboratories continue to seek CRADA arrangements with companies interested in advancing basic science.

Improved partnership arrangements could further promote the effectiveness of the Laboratories, and increasingly are essential in meeting National needs. The following strategies will help the Department contribute to the National goal of stimulating additional, effective partnerships that promote science and engineering:

- Further expand utilization of laboratory user facilities through simplified access by industry and universities.

- Increase opportunities for remote, "on-line" access to Laboratory research facilities. This service will eventually greatly expand access to user facilities by scientists, engineers, and even classrooms, through access via public communication networks such as Internet.

- Further streamline CRADA and other technology partnership procedures to shorten the time and reduce the complexity of finalizing agreements.

- Continue to seek CRADA arrangements with companies interested in advancing basic science.

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[15] Sometimes the costs are covered by a separate university or industry research contract with the government, but not by the laboratory.

4. Goal: Produce the Finest Scientists and Engineers for the Twenty-first Century and Raise the Scientific and Technological literacy of all Americans

DOE has capabilities that distinguish it from other agencies and institutions and allow it to make significant contributions to this National goal. The laboratories' large scientific work force, geographic diversity, world-class scientific facilities, technology development expertise, and capabilities in forming partnerships allow the Department to provide technical training and public enrichment experiences throughout the country. These facilities are major sites for undergraduate and graduate research performed as part of the normal educational curricula for thousands of students.

College and university-based education programs have been supported since the early days of the Atomic Energy Commission through student fellowships and research opportunities, curriculum development, and faculty enhancement. Undergraduate programs are conducted at both two-year and four-year institutions. Graduate and post-doctoral programs enhance research opportunities through fellowships at home institutions and Department of Energy facilities. Representative undergraduate and graduate programs include:

- The Science and Engineering Research Semester, which provides the opportunity for science and engineering students to participate in research during an academic term at seven of the Department's National Laboratories.

- The Faculty/Student Team Research program, which supports participation of faculty members with a small group of undergraduate and graduate students in on-going research at Department of Energy facilities.

The Department also makes significant contributions to all levels of mathematics and science education to help enhance the literacy of the public in science, mathematics and engineering. The Department's funding for pre-college education programs (K-12) has increased by approximately 400 percent over the past five years, reflecting the growing understanding that these early learning years are extremely important in motivating and retaining students' interest in mathematics and science.

The Department's pre-college programs improve the skills and knowledge of new and existing teachers, provide alternative learning environments, encourage curriculum reform, disseminate new materials and media, provide equipment and technical assistance to teachers, foster research on new methods and materials, and provide opportunities for students and teachers to perform research on current science and technology. Specific examples of DOE programs developed with or by the National Laboratories are:

- The National Science Bowl, an annual competition involving roughly 12,000 high school students nationwide.

- The Bay Area Science and Technology Education Collaboration, a multi-laboratory teacher enhancement program to improve math and science education in the Oakland Unified School District for grades K-12.

- The Teachers' Academy for Mathematics and Science in Chicago has set a goal of retraining over 15,000 math and science teachers in grades K-12 in this largely minority, largely poor urban system. This initiative emerged from collaborations by the Fermi National Accelerator Laboratory and Argonne National Laboratory with universities, museums, teachers' colleges, corporations and citizens' groups.

- Becoming Enthusiastic About Math and Science (BEAMS) brings fifth and sixth grade classes, with their teachers, to the Continuous Electron Beam Accelerator Facility (CEBAF) in Newport News, Virginia for a modified academic week.

- The New Explorers series of PBS television programs on topical science and technology issues, uses teaching materials developed under the leadership of Argonne National Laboratory.

The following strategies will help the Department contribute to the National goal of producing the finest scientists and engineers for the twenty-first century and raising the scientific and technical literacy of all Americans:

- Maintain excellence in recruiting scientists and engineers to the laboratories for continued intellectual renewal of these institutions and training of top graduates at the frontiers of science and technology.

- Strengthen laboratory interactions with universities.

- Continue to focus on pre-college enrichment educational programs for underrepresented populations.

- Continue to integrate education programs into the activities of the laboratories.

D. Conclusion

"Science reveals new world's to explore, and by implication new opportunities to seize and new futures to create." This statement by Vice President Al Gore[16], quoted in Science in the National Interest, captures the importance of a strong National investment in science and technology. For the Department of Energy and its laboratories, science and technology are the currency for meeting our mission requirements. The Laboratories support world-class scientists and engineers and unique, advanced research facilities which, help address complex, multi-disciplinary problems in areas ranging from national security to fusion energy to environmental clean-up.

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[16] The statement was made by Vice President Gore to the Forum on Science in the National Interest in February, 1994.

The research facilities at the Laboratories provide access for thousands of academic and industrial scientists to new frontiers in areas such as materials science and molecular biology. In this fashion, and by virtue of their distinguished record of scientific accomplishments, the Laboratories represent a National asset that warrants careful stewardship during an era when science holds the potential for addressing major National needs in health care, environmental quality, national security, and sustainable development. The Administration's new science policy provides the framework for helping sustain and guide the Department's scientific facilities and programs in the face of tight competition for resources. These facilities, like basic science in general, have provided a means of discovery and a record of technological innovation. The dividends of this investment will continue to accrue for generations to come.

III. Peer Review at the Department of Energy

A. Introduction

Merit review with peer evaluation is a powerful and effective tool for enhancing relevance and productivity in Federal research and development (R&D). Despite some of its well-documented shortcomings,[17] peer review stimulates competition, establishes high standards for quality, rewards productivity, and, on balance, fosters creativity and promotes fair play. When combined with energetic and visionary R&D program leadership, peer review can marshal highly competent R&D teams, focus scarce resources on the most important and potentially fruitful technical opportunities, and provide reasonable assurances to taxpayers that their Federal R&D dollars are being prudently invested.

On May 6, 1994, in a White House memorandum, the Office of Science and Technology Policy (OSTP) and the Office of Management and Budget (OMB) established merit review with peer evaluation as an "R&D policy principle" to be incorporated in all Federal agency R&D budgets for Fiscal Year 1996. Specifically, according to the memorandum, each Federal R&D agency is expected to

> ***"significantly enhance the utilization of merit review with peer evaluation and competitive selection in Federal R&D projects. Research not subject to merit review with peer evaluation is expected to decline and funding in these areas should be moved into areas of merit-reviewed research with peer evaluation."***

Further, increasing concern about accountability for efficient and productive use of government funds, including funds for government-supported R&D, has been reflected in recent Federal legislation and executive direction. The Chief Financial Officers Act, the Government Performance and Results Act, the Competition in Contracting Act, the revision of the Federal Acquisition Regulation, the National Performance Review initiative, and a number of other program evaluation initiatives from OMB have all had a profound effect on Federal agency management, oversight, and conduct of R&D programs.

The Department of Energy (DOE) fully embraces these principles of accountability, competition, and objective merit review, including peer review. In fact, it has already put in place many new ways of doing business that are strengthening their application. This paper documents the Department's continuing and expanding commitment to these principles and, in particular, to peer review.

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[17] Chubin, Daryl E. and Hackett, Edward J., *Peerless Science: Peer Review and U.S. Science Policy*. (Albany, NY: State University of New York Press, 1990).

B. Scope of Peer Review at the Department of Energy

At the Department of Energy, peer review means competent, qualified, objective, and formal evaluation using (1) specified criteria and (2) the review and advice of qualified peers. To be qualified, peers must be technically competent in the scientific and technical field under review. Peers may come from any source, including industry, academia, and government agencies and associated laboratories. To be objective, peers must be reasonably independent and free from conflict of interest. The results of peer reviews must be recorded and, under appropriate controls, accountable to further review.

Merit reviews meeting these criteria take on many and diverse forms. They are applied to R&D proposals, projects, and programs. They are applied, as well, to the design and acquisition of major research facilities and to the formulation of multiyear research plans and strategies. Appropriate forms of peer review are constructed and applied to activities at various organizational levels: the Department Secretary, Assistant Secretaries, program offices, National Laboratories, integrated laboratory R&D, research subcontractors (including universities), and laboratory user facilities. The nature of peer review at each level is tailored to the needs at that level.

Peer reviews are usually undertaken in the context of the allocation and use of scarce R&D resources. They may be used in conjunction with competitive selection processes, where peer reviews take place prior to the award or approval of a grant or contract, or where the research activities are chosen from a pool of qualified applicants following peer reviews. These types of peer review are called pre-award, or *prospective*, reviews Peer reviews may also be used in conjunction with evaluations of ongoing or recently completed research. These in-progress or performance reviews are called post-award, or *retrospective*, reviews. These latter reviews also strongly influence the allocation of R&D resources by what is sometimes referred to as selection by competitive survival.

Although the terms *prospective* and *retrospective* are useful constructs to describe *when* merit reviews with peer evaluation take place, the substance of both types of reviews are quite similar. In both cases, the merit of an investigator's or research group's record of accomplishments (retrospective considerations) *and* the projected course of future research (prospective considerations) bear directly on the evaluation.

1. Statutory and Regulatory Context

The Department of Energy, like other Federal R&D agencies, must carry out its scientific and technical missions within a larger context of statutory, regulatory, and procedural requirements governing the expenditure of R&D funds. This context varies for different programs, but in each case largely determines the way in which peer review principles and methods are applied.

The award of research contracts, for example, is governed by the Federal Acquisition Regulation and the Competition in Contracting Act, both of which require competition among bidders and formal selection processes. The Department employs peer review principles and methods, including the use of independent engineering and scientific reviewers, in the technical evaluation stage of all such selection processes related to R&D, except in relatively rare instances where sole-source selection may be justified.

Further, the award of research grants and cooperative agreements is governed by the Department's Financial Assistance Rules, as promulgated in the Code of Federal Regulations (10 CFR Part 600). The Department's major research organizations have promulgated formal rules in the CFR governing the merit review process for R&D financial assistance. These rules require the use of technical experts to perform credible merit reviews of all applications, solicited and unsolicited. Such merit reviews may make use of standing committees, ad hoc committees, or field readers, and generally include, in the spirit of peer evaluation, at least three qualified persons from outside the awarding program office, in addition to the designated contracting officer's representative.

A combination of Federal and Departmental regulations also governs the award of contracts at the Department's laboratories. Under the Federal Acquisition Regulation, a management and operating (M&O) contract is recognized as an appropriate instrument, or agreement, under which the government

> ***"contracts for the operation, maintenance, or support, on its behalf, of a government-owned or controlled research, development, special production, or testing establishment wholly or principally devoted to one or more major programs of the contracting Federal agency."***

Such M&O contracts permit the Department to draw upon, nurture, and maintain the special technical expertise and capabilities required for unique missions, such as those associated with nuclear weapons and large, multidisciplinary, integrated, non-weapons research. Over the years, the Department's missions and associated requirements for such specialized expertise and capabilities have given rise to the Department's laboratory system. Altogether, the replacement cost of the facilities of this system is currently estimated to exceed $30 billion. The laboratories employ about 50,000 people, representing a concentration of technical talent that includes more than 8,500 Ph.D.s and several Nobel laureates.

Examples of specialized research facilities located at these laboratories include accelerators for the study of high energy physics, the world's most powerful computers and lasers, synchrotron light sources for probing the structure of materials, facilities for producing medical isotopes, and instrumentation laboratories for characterizing the details of flame propagation and combustion. The Department owns and maintains these facilities and, with the exception of the classified facilities, makes them available to researchers from all sectors of the economy, public and private. The Department underwrites the operating costs for experimenters who openly share their data with the scientific community. Commercial users may also use the facilities to conduct proprietary research, but on the condition that they participate on a full-cost-recovery basis. Peer review is routinely employed to allocate available time and select the experiments conducted at the major research facilities, with some facilities having waiting lists exceeding a year.

Under a DOE-initiated contract reform[18], the Department's M&O contracts now require, or will soon require, regular performance-based merit reviews to ensure accountability in M&O contractor performance. M&O contracts that do not now contain such requirements will incorporate them when the contracts come up for renewal or renegotiation. In addition, all laboratories have an array of outside advisory panels that periodically review and advise on the relevance and productivity of laboratory-conducted R&D.

Finally, one M&O contractor seldom performs all of its R&D tasking by itself. Whether under a lead-laboratory or other management arrangement with the Department, a portion of the R&D is typically subcontracted to universities, private laboratories, or other R&D performers. At the National Renewable Energy Laboratory, for example, one-half of the laboratory's total funding supports research subcontracted to outside R&D performers. At Argonne National Laboratory, Oak Ridge National Laboratory, and Pacific Northwest Laboratory, this figure varies between 10 and 20 percent. At other laboratories, this figure is less. All such subcontracts, likewise, are governed by contract provisions that generally require both competitive selection processes, which in the case of R&D generally involve merit reviews with peer evaluation, and periodic evaluations of contractor performance.

2. R&D Programs Subject to Peer Review

The Department's overall R&D budget for Fiscal Year 1994 is estimated, depending upon one's precise definition of R&D, to be about $7.4 billion, as shown in Appendix A. This amount may be grouped into three broad, roughly equal, categories: fundamental science and energy research ($2.4 billion); civilian energy technology and related R&D ($2.8 billion); and national security R&D ($2.2 billion).

Of the $7.4 billion total, approximately 20 percent supports research carried out by R&D performers employed outside the Department and its laboratory system. Performers include industry, universities, public and private research institutions, and R&D consortia. The instruments used to convey funding to these R&D performers include Department-awarded grants, cooperative agreements and contracts, and laboratory-awarded research subcontracts.
Of the remaining 80 percent, most supports research and related activities carried out by performers within the Department and its laboratory system. Of this, approximately 40 percent supports the operation, maintenance, construction, and modernization of the specialized research and related user facilities. Another 35 percent supports internal laboratory research programs. The remaining 25 percent supports other functions, including general infrastructure (for example, roads, utilities), overhead, and other indirect costs.

The mix of R&D activities calls for a variety of approaches to managing research and applying peer review principles and methods. For example, research by outside R&D performers, because of the nature of the procurement instruments used to convey funding, is governed by statutory and regulatory requirements that require, in one form or another, merit reviews, mostly with peer evaluation, in conjunction with pre-award competitive selection processes. The M&O contracts are, likewise, competed and regularly evaluated, with increasing emphasis on specific performance-based measurement criteria. Also, because experimental time on the special facilities is so highly valued and demand exceeds supply, virtually all access to the facilities is allocated through some means of merit review with peer evaluation.

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[18] U.S. Department of Energy, "Making Contracting Work Better and Cost Less; Report of the Contract Reform Team." (Washington, DC: U.S. Department of Energy, February 1994).

Peer review coverage of the internal research programs at each laboratory is, likewise, varied. The greater portion is subject to retrospective merit reviews, called for by management and conducted most often by scientists who are independent of the laboratory, in conjunction with outside program reviews and advisory committee oversight. A lesser portion is subject to prospective peer review as exemplified somewhat narrowly by the highly successful laboratory directors' discretionary R&D program and more broadly by the many programs managed within Departmental headquarters that apply peer review principles and methods to the evaluation of laboratory Field Work Proposals. This latter process is illuminated later in this paper.

Even though the Department applies different peer review methods to guide its research programs, both outside and internal, a sampling of R&D projects, using retrospective merit review by independent experts, provides evidence that research quality and relevance of both types of research programs are comparable. For example, an organization within the Office of Energy Research (the Office of Program Analysis) regularly conducts, at the invitation of R&D program managers, retrospective peer reviews of R&D programs throughout the Department. Using an interactive method with independent, outside expert reviewers, this organization has evaluated more than 2,700 research projects over 12 years, covering about 20 percent of the Department's civilian basic research and technology development programs. The most recent data, which includes 744 research projects in Basic Energy Sciences conducted at both national laboratories and universities, produced results showing that the research programs of both internal and outside R&D performers shared nearly identical statistical profiles on research quality and relevance. These retrospective peer reviews, it should be noted, are in addition to other reviews administered by the program managers and serve as an independent measure of research quality and relevance.

Finally, above the project level, at higher levels of decisionmaking in the organizational hierarchy, the Department makes extensive, although not comprehensive, use of expert advisory bodies, constituted under the Federal Advisory Committee Act, and the National Academies. Peer input is also obtained from workshops, technical society meetings and symposia, and extensive publication in the peer-reviewed literature.

C. Current Peer Review Practices at the Department of Energy

The scientific and technology development missions of the Department of Energy are extraordinarily diverse and far-ranging. The Department is among the largest supporters of fundamental science and basic research across many disciplinary areas and technical fields. Its applied research and technology development programs concentrate primarily on the

Department's energy, environmental, and national security missions, but in doing so embrace countless forefront areas of research vital to industry, commerce, and trade. The Department also builds and equips many of the premier R&D facilities vital to U.S. competitiveness and used by U.S. universities, corporations, and nonprofit research institutes.

In these respects, the Department is endowed with highly valuable R&D resources for which there is intense competition. The Department has found over the years that this competition is most productively and equitably managed by merit review practices that involve objective reviews and advice, that is, by peer review. It has also found, however, that peer review practices must be appropriately tailored to each context, depending on the nature of the research activities performed and the R&D community served.

Finally, and importantly, peer review systems at the Department do not now, nor must they in the future, preclude the possibility of initiating some research programs without peer review. Preserving this flexibility is vital. Programs representing entirely new research directions, research at the interfaces between established communities, or essential elements in critical mission areas often do not survive traditional peer review. If the Department had applied peer review rigidly, without flexibility or regard to such weaknesses, it might not have funded Dr. Luis Alvarez, whose work ultimately led to the meteor-impact theory of the extinction of the dinosaurs. This was world-class science -- neutron activation analysis of iridium anomalies in soil samples at the Cretaceous-Tertiary geologic boundary -- that used the Department's skills and facilities in novel ways that led to a revolution in thinking about our planet and its history.

1. Fundamental Science and Energy Research

Virtually all of the Department's fundamental science and energy research programs undergo merit review of one form or another in order to ensure scientific excellence and mission relevance. Peer evaluation is used extensively in these merit review processes.

Nearly all research conducted by R&D performers outside the Department and its laboratory system is governed by formal processes of prospective merit review with peer evaluation and competitive selection. Such processes are codified under the Office of Energy Research's Financial Assistance Program (10 CFR Part 605), which, with some exceptions for flexibility, requires each funded grant proposal to receive a minimum of three external peer reviews. Proposals are peer reviewed for scientific excellence. This process shares many features of the merit review system of the National Science Foundation. Performance is also reviewed as part of all renewal proposals, which typically occur on three-year cycles.

Internal research programs at the Department's laboratories, likewise, undergo merit review. These reviews consist of a mix of prospective and retrospective reviews, and in many cases, both. They employ varying degrees of peer evaluation at both the laboratory and Departmental oversight levels, including regular annual reviews of program management and onsite project reviews by Departmental staff. In addition, all labs, user facilities, and major research divisions have visiting committees of outside experts that provide annual peer review of research relevance and quality.

Every internal laboratory research program is also reviewed annually by Headquarters as part of the laboratory Field Work Proposal (FWP) submission process, in accordance with the provisions of the governing M&O contracts. Field Work Proposals are the means by which the laboratories formally propose future work and seek authorization for expending R&D funds. Field Work Proposals may vary in the extent of their specificity, but in those programs that depend heavily on the use of prospective peer review in approving laboratory R&D funding, FWPs are required to be of peer review quality. Such practices are routine in the Office of Health and Environmental Research, the Experimental Plasma Research portions of the Fusion Energy Program, several major divisions of Basic Energy Sciences, and others.

In the Office of Health and Environmental Research, for example, all FWPs are required to be of peer review quality and to be externally reviewed by independent experts. Regardless of merit review method, all research projects are annually reviewed, and any project may be redirected or terminated as a result of these reviews. All new proposals are subject to merit review with peer evaluation.

Because one of the primary goals of all scientific research is to advance the forefront of knowledge, publication of original work is an essential element of the overall research activity. DOE-supported scientists, whether outside R&D performers or internal to the laboratories, are continually evaluated by the quality of their original research as published in archival, peer-reviewed journals. This publication of original work in the open literature in itself constitutes another and important form of peer review. The Department relies upon it to both guide and gauge the relevance and productivity of its internal research activities.

The Department also makes extensive use of the National Academy of Sciences and a number of standing committees constituted under the Federal Advisory Committee Act. The Office of Energy Research, for example, routinely obtains advice on program content, quality, future direction, priorities, and proposed facilities from the Basic Energy Sciences Advisory Committee, the Health and Environmental Research Advisory Committee, the High Energy Physics Advisory Panel, the Nuclear Sciences Advisory Committee, and the Fusion Energy Advisory Committee. Their expert and independent nature enable these advisory committees to provide additional and valuable outside advice used to guide the Department's R&D activities at the overall program level.

2. Civilian Energy Technology and Related R&D

The objectives of the civilian energy technology and related R&D programs, such as those focused on energy efficiency, pollution prevention, environmental management, renewable energy, coal, oil, and natural gas, largely aim at advancing technologies for use in the general economy. This means that the management and direction of such programs must involve not just technical experts, but also those who will ultimately manufacture, market, and use the technologies. This calls for collaborative modes of R&D review and conduct that fully engage participation among those who understand competitive markets and consumer demands.

Accordingly, many of the Department's energy technology development and related R&D programs are deliberately designed to accommodate industrial partners. In various ways, these industrial partners provide substantial opportunities for external merit review by engaging themselves as full participants helping to plan, execute, and commercialize the R&D.

In addition, the Department makes extensive use of R&D procurement arrangements that not only involve industry, but require cost-sharing by industry. Section 3002 of the Energy Policy Act of 1992 establishes minimum cost-sharing thresholds of 50 percent for technology demonstration and commercialization projects, and 20 percent for all other civilian energy research. The resulting contracts thus benefit both from the routine competitive selection practices, as prescribed in Section 935.016-1 of the Department of Energy Acquisition Regulation, and from one of the most severe outside tests of research relevance, that is, substantial financial investment from industrial R&D partners.

At the Department's national laboratories, there is likewise a significant degree of external review of, and internal competition for, the energy technology development and related R&D programs. Every laboratory has an array of industrial advisory panels employed to review the R&D activities of each of its major research divisions. Individual research investigators must continually submit to a battery of scientific and technical reviews, both prospective and retrospective. Prospective evaluations include merit reviews of individual work proposals, almost always involving internal peers and sometimes involving external peers. Prospective evaluations also include multilevel internal reviews of the laboratories' formally submitted Field Work Proposals before they are sent to Departmental headquarters. Retrospective evaluations are performed on all R&D projects at least annually, but more typically are performed as an integral part of the course of ongoing research -- by colleagues, laboratory superiors, clients at Headquarters, as well as by peer reviewers of research publications. In addition, retrospective evaluations using peer review are employed on an ad hoc or sampling basis to review ongoing research involving specific projects, cooperative research and development agreements (CRADAs), and other forms of joint R&D.

Input from peers is also obtained from contractor review meetings, workshops, technical society meetings, and symposia. Fossil Energy programs and Energy Efficiency programs have made use on a selective basis of the Office of Energy Research's Office of Program Analysis to conduct formal, independent, retrospective peer reviews of their applied research projects.

Peer review processes in some elements of the Department's civilian R&D programs are currently undergoing significant enhancement. The Technology Development program of the Office of Environmental Management, for example, is instituting peer review at the program level (see below), and is strengthening the use of "focus area review groups" at the sub-program level. Beginning in Fiscal Year 1995, laboratory Field Work Proposals, known in the Environmental Management program as Technical Task Plans, will be reviewed by teams of subject matter specialists from technical, regulatory, business, and stakeholder perspectives.

Virtually all major energy technology development and related R&D programs are periodically subjected to higher level overall program reviews involving extensive use of scientific and technical experts and industry stakeholders. The most visible of these are review committees of the National Academy of Sciences and the standing Departmental advisory committees constituted under the auspices of the Federal Advisory Committee Act. These bodies are asked primarily to comment on the content and direction of the R&D programs, including their 5-year R&D plans and associated strategic plans.

In the Technology Development program of the Office of Environmental Management, for example, top-level program reviews are conducted by the Environmental Management Advisory Board and, beginning in Fiscal Year 1995, a newly established Committee on Environmental Management Technologies of the National Academy of Sciences. Similarly, the Office of Fossil Energy is advised by the National Petroleum Council and the National Coal Council. Altogether, there are eight active committees advising the civilian energy technology and related R&D programs.

Finally, with the implementation of strategic planning and Total Quality Management principles throughout the Department, most key planning and programming decisions are now evolved in full view of and with broad participation from outside stakeholders. For example, the Department's recently developed multiyear plan for Integrated Resource Planning was distributed to 350 stakeholders in the electric and natural gas utility industry, with formal comments received from 40 reviewers. In the Department today, every such plan must evidence extensive use of outside independent participation, review, and comment.

3. National Security R&D

The Department's national security responsibilities require highly integrated, multidisciplinary, multiyear team efforts. These requirements are imposed by both the complexity and seriousness of the nuclear weapons enterprise. The Department must maintain its responsible stewardship of the nuclear weapons stockpile and preserve the special nuclear weapons technology infrastructure and core competencies that may be needed in future national security situations. At the same time, it must dismantle nuclear weapons and dispose of special nuclear materials, as specified by international agreement, and contribute to the enforcement of arms control agreements and to the prevention of the proliferation of nuclear weapons. The R&D needed to support these missions requires unique facilities, special materials-handling procedures, and highly classified know-how that, while amenable to technical review and peer review, are not always amenable to the same kind of peer review processes that are employed in the realm of unclassified research.

The Department has established, for example, formal peer review processes in the Office of Defense Programs. Weapons life-cycle activities are addressed by formalized joint Department of Energy-Department of Defense project teams whose members come from both organizations. The Nuclear Weapons Council provides a high-level mechanism for advising on Defense Programs directions. Interaction with the Department of Defense also provides close customer feedback on major aspects of program performance.

The Department also uses formal committees composed of outside experts to review or advise on Defense Programs, including the Safety, Security, and Control Committee; the Weapon Safety Advisory Review Group; and the Inertial Confinement Fusion Advisory Panel. The Containment Evaluation Panel and the Threshold Test Ban Review Panel have also reviewed issues related to nuclear testing.

Defense Programs also uses independent outside expert groups, such as JASON (a highly qualified advisory body of scientists), to review its classified programs. The National Academy of Sciences has also reviewed Defense Programs technical activities. A large amount of unclassified research conducted within the Defense Programs is published in open peer-reviewed journals. There is also a classified peer-reviewed journal to which laboratory researchers actively contribute.

In the case of nuclear device design and much of the related weapons science and technology, detailed review requires active expertise, and there exists no broad industrial or university base from which to draw such experts. Historically, technical competition has proven invaluable in this field and peer reviews are so designed into program activities in large part by the existence of two nuclear design laboratories, at Lawrence Livermore and Los Alamos. One-on-one interactions between researchers in highly classified but related fields at these two laboratories add considerably to the quality improvement process at both laboratories.

Sandia National Laboratory employs an effective means of intramural review, using "red teams" to ensure the safety and reliability of Sandia components and processes. Defense Programs has further established a formal interlaboratory (Los Alamos, Lawrence Livermore, and Sandia) peer review process for specific weapon R&D, certification, and surveillance activities. For example, every five years, with annual updates, Lawrence Livermore-Sandia and Los Alamos-Sandia teams in the Weapons Assessment Process conduct peer-reviewed studies of each other's stockpile weapons.

Recent M&O contracts for Los Alamos and Lawrence Livermore require the University of California to conduct annual science and technology self-assessments stressing external peer reviews with specific criteria. These are being implemented using evaluations by appropriately constituted external review committees of experts. These committees, taken together, evaluate all technical activities at these laboratories. The University of California President's Council Panel on National Security reviews the weapons programs of Los Alamos and Livermore. Panel members include technical experts drawn from outside the University of California and laboratory communities. These and other mechanisms are used to assess and maintain quality in these programs.

D. Comparisons with Other Federal Agencies

More than 20 Federal agencies carry out R&D programs. Of these, the Department of Energy's R&D program is one of the largest, being responsible for about 10 percent of the total Federal R&D budget of $72 billion in Fiscal Year 1994. In addition, the Department of

Energy has perhaps one of the most diverse set of missions, complicated by the unique demands of nuclear weapons design.

Because of this diversity and size, the Department's R&D programs taken together resemble the many facets of Federal R&D programs as a whole. Similarly, the Department's application of peer review principles and methods share many of the strengths, as well as some of the weaknesses, of such practices as applied to Federal R&D in general. Other agencies, for example, use an array of peer review methods, at all organizational levels, to promote quality, relevance, and productivity in R&D programs. The Department, likewise, applies these methods to the different levels in the management process hierarchy, and to the different types of R&D activities, as is most appropriate to each situation.

The National Institutes of Health, the National Science Foundation, and many parts of the Department of Energy's fundamental science, health and environmental research, and basic energy sciences programs all have extensive external research programs in the physical and life sciences. Each agency uses similar prospective peer review methods, by mail, or by panels, before funding proposals. Some agencies with their own laboratories also make available their research facilities for the benefit of other users, such as the National Aeronautics and Space Administration's wind tunnels. Research at such user facilities, like that at the Department's facilities, is merit-reviewed using prospective peer reviews.

Like the Department of Energy, the Departments of Defense and Commerce (the National Institute of Standards and Technology), the National Aeronautics and Space Administration, and, to some extent, the National Institutes of Health (NIH) all conduct internal laboratory research programs. Each agency relies primarily upon in-progress, retrospective reviews for guiding and gauging its internal laboratory research.

In the area of basic research, the National Institutes of Health is an agency often cited as a model for emulation in its use of merit reviews with peer evaluation. Ninety percent of the research activities at NIH are external, and are subjected to a two-stage review process. In the first stage at NIH, a panel of 15 to 20 scientists, experts in the relevant field, read each proposal. Generally, three panel members review each proposal in detail against specified criteria and prepare formal briefs, while the other panelists familiarize themselves with each proposal. All panelists take part in a group discussion and vote formally. The panel then reports to a National Advisory Council for the second stage. Each institute of the NIH has a single National Advisory Council of at least 12 members, not all of whom are necessarily scientists (in most proposals, there are considerations beyond pure science).

Review of internal laboratory research at the NIH is conducted by the Board of Scientific Counselors for each institute. Each board consists of outside scientists chosen for their expertise related to each institute. However, it should be noted that many Board members are funded by the institute under review.

An authoritative critique[19] of the NIH peer review system concluded that (a) the excellence of the overall NIH research program is built on a variety of approaches to managing research, using both prospective and retrospective reviews; (b) prospective and retrospective peer review have different strengths and weaknesses, and encourage creativity in different ways; and (c) the overall NIH research program was best served by retaining prospective review in its external (for example, R&D support via grants) programs and retrospective review in its internal (for example, in-house laboratory) programs.

As strong as the NIH and other agency peer review practices appear to be, in each area where commonality exists among research kind (for example, basic research) and communities (for example, universities, research centers), the Department of Energy has well-established peer review practices that are quite comparable and, perhaps, better in some areas. This comparability notwithstanding, the Department can only benefit by examining more thoroughly and understanding more completely the best practices of other agencies. To this end, the Department intends to continue its study of other agency practices, participate in interagency forums on peer review, and implement some pilot programs to test innovative approaches.

The sharing of peer review strengths, however, means that the Department may also share some of its weaknesses. The process of merit review with peer evaluation, in general, is under pressure and has been criticized by many in the research community, in part, due to its cost, complexity, administrative burden, lack of available peers, slowness, and questions about equity and fairness. Even with these concerns, however, peer review is still widely regarded as the best method available for allocating scarce R&D resources. Accordingly, the Department of Energy seeks ways to both respond to these concerns and develop improved peer review systems, as outlined below.

E. Conclusions and Opportunities for Improvement

As documented in this paper, the Department of Energy uses peer review extensively throughout its R&D programs to both guide research direction (prospective peer review) and gauge research progress (retrospective peer review). In many instances, both forms of peer review are applied to the same research activity. The Department's peer review practices in many of its more mature R&D programs may be counted among the best practices of all agencies. Peer review practices in some of the more recently established and growing R&D programs are evolving and being strengthened. Virtually all major R&D programs experience multiple levels of review by qualified and independent review and advisory committees.

External R&D activities conducted via grants, contracts, and cooperative agreements are governed by an elaborate system of statutory, regulatory, and procedural requirements that virtually ensure that the vast majority of R&D awards are subjected to merit reviews with peer evaluation and competitive selection. Internal laboratory R&D activities are likewise subjected to multiple reviews by peers, both prospective and retrospective, with increasing competition. Retrospective merit reviews with peer evaluation have been confirmed by independent studies as an effective means for promoting research relevance and productivity in the laboratories. Moreover, in many Departmental laboratory R&D programs, retrospective reviews are increasingly being supplemented by prospective reviews of laboratory Field Work Proposals, where appropriate. Administrative requirements for cost-sharing and joint planning of applied R&D with industry add further to the checks and balances of R&D management.

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[19] National Institutes of Health, "Report of the External Advisory Committee of the Director's Advisory Committee." (Washington, DC: National Institutes of Health, April 1994).

In April 1994, the Department reaffirmed its strong commitment to peer review in its strategic plan, *Fueling A Competitive Economy,* by specifying that an important "success indicator" for its science and technology programs is

> ***"quality of science, as indicated by favorable outside peer reviews and judgment of expert advisory committees."***

Recognizing the importance of peer review, having surveyed peer review practices at other Federal agencies, and having reviewed the suggestions of such experts as Chubin and Hackett,[20] Bozeman,[21] and Kostoff[22] for the evaluation and improved use of peer review, the Department intends to strengthen further its use of peer review, in forms appropriate to its missions, in all of its technical programs, and at all levels of decisionmaking.

In so proceeding, the Department recognizes that serious reviews can impose major costs on those being reviewed, as well as on the reviewers and supporting staff. Peer review systems can introduce significant delays in R&D program execution. If implemented too rigidly, peer review systems can stifle flexibility and creativity. The experiences of several R&D agencies suggest that it is possible to create elaborate systems of overlapping reviews that are unnecessarily complex and burdensome.

Being aware of these potential risks, the Department has identified three broad areas for improvement.

F. Enhanced Application of Peer Review

First, *while recognizing the need for flexibility and efficiency, the Department of Energy will seek to enhance the use and application of peer review at all appropriate levels of R&D program management and execution.*

- Peer review applied at the highest level of management checks the research agenda and helps to inform the processes that establish top-level guidance for R&D priorities throughout the agency. Filling a gap in such coverage, an advisory task force for strategic energy R&D, similar to those advising the Secretary on science and defense matters, will be chartered to serve this function under the auspices of the Secretary of Energy Advisory Board.

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[20] Chubin, Daryl E., et al., *op. cit.*

[21] Bozeman, B., "Peer Review and Evaluation of R&D Impacts", in ed. Bozeman, B., and Melkers, J., *Evaluating R&D Impacts: Methods and Practice*, p. 79-98. (Boston, MA: Kluwer Academic Publishers, 1993).

[22] Kostoff, R., "Assessing Research Impact: Federal Peer Review Practices", in ed. Kostoff, R., *Evaluation Review* vol. 18, No. 1, p. 31-40. (Sage Publications, February 1994).

- Where appropriate, gaps will also be filled in the coverage of expert advisory committees at the Assistant Secretary level and in the use of outside expert peer reviews at the major R&D program level.

- Recognizing that outstanding leadership can often take R&D programs to great heights of accomplishment, the Department will include R&D program leadership, at both Departmental headquarters and in the field, as a specific element in future major R&D program reviews.

- In its laboratory system of Field Work Proposals, the Department will encourage enhanced quality of FWPs and the expanded use, where appropriate, of prospective merit reviews with peer evaluation of FWPs for new projects, emulating current practices of many of the Department's basic research programs.

- At the outset of new major R&D program initiatives, plans will be established, as appropriate, to apply peer review principles and methods at all suitable levels.

- In implementing the Department's initiatives in contract reform, measurements of contractor performance, including M&O contractors, will be extended, as appropriate, to include an evaluation of the use of peer review principles and methods.

1. Improved Peer Review Processes

Second, *the Department of Energy's management of its peer review processes will be strengthened, including the establishment of guiding policies and principles, improved oversight, and broadened documentation of use.*

- The Department will build on the successful peer review record of many of its programs, and establish guidelines for conducting peer review at various levels of management, tailoring them to meet the particular information needs and unique features of the programs and missions to which they would apply.

- Periodic and random sampling will assess the use and effectiveness of the peer reviews and identify areas for improvement. This may also include broadened coverage of the in-progress peer review program currently under way in the Office of Energy Research.

- A process for linking peer review principles and methods and other evaluative activities to the Department's strategic planning, budget formulation, and performance management activities will be developed and implemented, in conjunction with related efforts responding to the Chief Financial Officer Act and the Government Performance and Results Act.

- The Department will explore ways to reward the effective use of peer review, including simplification of administrative procedures and relaxation of oversight controls, in areas where R&D excellence has been demonstrated.

2. Peer Review Research and Innovation

Third, *the Department will be a leader in examining peer review processes and best practices, and in developing and implementing recommendations for improvements in the application of peer review to today's science and technology environment.*

- As part of the Department's oversight of peer review practices and increased use of performance-based contracting, collection of data on the practice and nature of various forms of peer review will be established. Information on current peer review practices will address, to the extent practicable, methods, costs, and benefits, and identify areas of improvement.

- Research on improved methods for peer review will be encouraged and communicated. Tradeoffs must be addressed between accountability and scientific freedom, efficiency and thoroughness, as must issues of the effectiveness, robustness, responsiveness, fairness of review, and adherence to technical standards of good measurement, including validity and reliability.

- A study, including surveys of the literature and interviews with both private and Federal agency R&D managers, will examine the various models for conducting Federal R&D and propose innovative approaches to the application and use of peer review to the accomplishment of the Department's R&D missions.

- A series of pilot programs will be established to test the expanded use of peer review, or modifications of peer review, in areas where it is not now uniformly applied, or where prospective reviews might be beneficially substituted for some retrospective reviews, such as in some of the Department's internal laboratory R&D programs.

- While some parts of the Department have excellent peer review systems already in place, new criteria for selection and effective use of peers will be developed and added to Departmental guidelines, as needed. These criteria may address such issues as the competence and objectivity of peers and methods to deal with reviewer bias and dysfunctional group dynamics.

Appendix A

SCIENCE & TECHNOLOGY FY 92-94			
		FY 1993	FY 1994
	FY 1992	Adjusted	Adjusted
	Actual	Approp	Approp
Area	$M	$M	$M
FUNDAMENTAL SCIENCE & ENERGY RESEARCH			
Energy Research			
Biological & Environmental Research	369.5	380.6	412.3
Basic Energy Sciences			
Materials Sciences	253.4	273.3	271.6
Chemical Sciences	156.5	163.6	166.3
Energy Biosciences	24.4	25.5	26.6
Engineering & Geosciences	35.4	36.5	37.2
Applied Math Sciences	80.5	83.9	103.7
Advanced Energy Projects	54.7	11.0	11.2
All Other BES	155.5	258.1	173.8
Subtotal BES	760.4	851.9	790.4
Other Energy Research			
Advanced Neutron Source	0.0	0.0	17.0
University & Science Education Programs	54.1	55.9	57.9
Laboratory Technology Transfer	10.0	9.9	39.2
Multi-Program Laboratory Support	25.6	26.7	41.3
All Other	15.8	15.7	20.1
Subtotal Other ER	105.5	108.2	175.5
TOTAL ER	1,235.4	1,340.7	1,378.2
GENERAL SCIENCE			
High Energy Physics	618.4	606.1	617.5
Nuclear Physics	351.4	306.6	348.6
SSC Not Including Terminiation Costs	482.6	515.4	0.0
All Other	6.4	(21.7)	9.0
TOTAL GEN SCI	1,458.8	1,406.4	975.1
TOTAL FND SCIENCE	2,694.2	2,747.1	2,353.3
CIVILIAN ENERGY TECH DEVELOPMENT & RELATED R&D			
CLEAN COAL TECHNOLOGY			
Advance Appropriation - Round 4 & 5	460.1	525.0	400.0

Appropriation	(50.0)	(525.0)	(175.0)
TOTAL CCT	410.1	0.0	225.0
FOSSIL ENERGY R&D			
Coal	225.6	186.3	167.3
Petroleum	56.5	61.6	75.3
Natural Gas	63.2	79.5	96.1
All Other	95.2	86.7	92.0
TOTAL FE R&D	440.5	414.1	430.7
CONSERVATION R&D			
Transportation	109.3	138.6	178.6
Utility	4.7	4.9	6.8
Industry	96.7	111.7	125.0
Buildings	47.1	52.3	81.4
Policy & Management	2.7	3.6	4.7
TOTAL CONS R&D	260.5	311.1	396.5
RENEWABLES R&D			
Solar energy	174.3	186.2	252.3
Geothermal	26.9	23.2	24.0
Hydrogen Research	0.0	0.0	10.0
Hydropower	1.0	1.1	1.1
Electric Energy Systems	30.4	32.1	38.6
Energy Storage Systems	7.2	10.2	17.5
Policy & Management - CE	1.9	2.9	3.9
TOTAL RENEW R&D	241.7	255.7	347.4
NUCLEAR ENERGY			
Civilian Nuclear Power			
Light Water Reactor	61.9	57.8	57.6
Advanced Reactor R&D	60.0	59.2	41.8
Facilities	96.6	92.7	6.7
Subtotal Civ Nuc Pwr	218.5	209.7	106.1
Space-Related Programs			
Advanced Radioisotope Power	51.9	54.4	52.7
Space Reactor Power System	40.0	29.8	27.4
Space Exploration Initiative	5.0	0.0	0.0
Subtotal Space-Related	96.9	84.2	80.1
Others			
Oak Ridge Landlord	0.0	0.0	24.9

Test Reactor Area Hot Cells	0.0	0.0	1.4
Test Reactor Area Landlord	0.0	0.0	0.0
Adv Test Reactor Fusion Irridation	0.0	0.0	0.0
All Other Except Termination Costs	48.9	48.0	23.1
Subtotal Others	48.9	48.0	49.4
TOTAL NE R&D	364.3	341.9	235.6
ENERGY RESEARCH			
Fusion Program	332.2	335.2	343.6
URANIUM ENRICHMENT			
AVLIS	161.7	0.0	0.0
Alternative Applications	1.0	0.0	0.0
TOTAL UE	162.7	0.0	0.0
RADIOACTIVE WASTE R&D			
Nuclear Waste Fund Activities	275.1	275.1	260.0
Civilian Waste R&D	5.1	4.9	0.7
Defense Nuclear Waste Disposal	0.0	100.0	120.0
TOTAL RW	280.2	380.0	380.7
ENVIRONMENTAL RESTORATION & WASTE MGMT			
Technology Development Defense	286.3	333.7	397.5
Technology Development - Civilian	0.0	0.0	0.0
TOTAL ER & WM	286.3	333.7	397.5
ES & H - ENVIRONMENTAL R&D			
Epidemiology & Health Surveillance	47.7	49.5	49.2
TOTAL TECH DEVEL & REL R&D	2,826.2	2,421.2	2,806.2
NATIONAL SECURITY R&D			
Atomic Energy Defense Activities			
Weapons Activities - R&D	1,431.7	1,536.0	1,298.8
Naval Reactors Development	695.2	730.0	684.4
Nonproliferation & Verification R&D 1/	210.0	219.9	235.0

Educations Programs	49.9	52.6	0.0
TOTAL NATL SEC R&D	2,386.8	2,538.5	2,218.2
TOTAL DOE	7,907.2	7,706.8	7,377.7
1/ Estimated amount for FY 1992; actual amount not available.			

IV. Core Technical Capabilities of the DOE Laboratories

A. Introduction

The Department of Energy Laboratories are the product of several decades of investment by the nation both in facilities and in a highly trained workforce of scientists, engineers, technicians, and other support personnel. This paper provides quantitative and qualitative information about the core technical capabilities of the laboratories, and about how these capabilities are represented in terms of the laboratories' budgets, personnel levels, replacement value of major facilities, industrial partnerships, patents and licenses, and R&D 100 awards.[23] Short narrative profiles for each of the nine multi-program laboratories and the National Renewable Energy Laboratory are provided to give a fuller picture of the distinguishing characteristics of these institutions.

B. Core Technical Capabilities

Over the past several years, the Department of Energy laboratories increasingly have been using the concepts of "core competencies" and "core technical capabilities" as a means of assessing and managing their key areas of technical strength. The core competency concept has been utilized effectively in the private sector as companies have worked to achieve enhanced focus and market expansion based on their firms' distinctive strengths.[24] In 1993, the Department initiated a process aimed at adapting the core competency methodology to the entire DOE laboratory system. That effort resulted in the first-ever characterization of the core competencies of the DOE laboratories.[25]

DOE defines a core competency *as a distinguishing integration of capabilities that enables an organization to deliver mission results and products to its customers.* The major criteria which the Department has used to determine its core technical capabilities are:

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[23] The R&D 100 Awards are given each year to innovations both in public and private institutions which hold a high prospect for commercial success. The Department of Energy laboratories have received more of these awards than all other federal agency laboratories combined; more than 50 percent of the113 award-winning DOE technologies between 1989 and 1992 already have been commercialized.

[24] C.K. Prahalad and Gary Hamel, The Core Competence of the Corporation, Harvard Business Review. May-June, 1990, pp. 79-91.

[25] The results of this excercise were reported in Changes and Challenges at the Department of Energy Laboratories: Report of the Laboratory Missions Priority Team. That report termed the major laboratory strengths as "core competencies." Others have commented that these more accurately are the "core technical capabilities" of the laboratories. For this purposes of this paper, the term core technical capabilities is used.

- ***Vital to Mission Delivery***: The core technical capabilities exist to enable the organization to achieve its current and future missions and/or strategic intent;

- ***Distinguishing***: The organization is recognized as being one of a few to achieve excellence in its areas of expertise;

- ***Comparative Advantage***: The capability enables the laboratory to add value to the solution of a broad set of national problems in a fashion that is distinctive from other R&D performers;

- ***Difficult to Reproduce***: The expertise and capabilities embodied by the invested resources are difficult for others to duplicate; and

- ***Demonstrated***: The capabilities have had prior or current effect when applied to problems of national importance; and

- ***Enduring Value***: Competencies have been built to enable the organization to satisfy past, present and future mission, and they need to be responsive to mission changes of the future;

These criteria helped lead to establishment of the following eight core technical capabilities for the DOE Laboratory System:

- ***Advanced Materials Synthesis, Characterization and Processing***. The laboratories employ more than 2,000 scientists and engineers in advanced materials R&D and operate state-of-the-art facilities for conducting materials synthesis, characterization, and processing. Synthesized materials include high-performance ceramics, metallic alloys, intermetallics, polymers, composites, aerogels, superconductors, semiconductors, and high performance magnetic materials. Materials characterization is conducted at diverse facilities throughout the DOE complex including synchrotron light sources, neutron scattering centers, microscope facilities, high-temperature materials laboratories, and centers for microelectronics technology development, design and fabrication. The labs also have unique resources for processing materials, such as actinides and actinide alloys, as well as forming and heat-treating exotic alloys, shaping ceramic composites, developing optical materials, formulating and applying aerogels, and depositing multicomponent thin films. *Working with industry, universities and other Federal agencies, the laboratories provide a vital resource -- including scientific user facilities -- for advances in materials technologies critical to future national needs in energy, environment, health, industrial competitiveness, and security*.

- ***Advanced Computing, Modeling and Simulation***. The high-performance computing core competency has been a major basis of weapons design for more than 40 years. This capability includes integration of theory, modeling, simulation and advanced computing, and networking for a wide variety of engineering and experimental designs. All DOE laboratories use networking and high-performance computing to address complex problems by integrating theory, modeling, and simulation. Major DOE laboratories also all have important classes of supercomputing capabilities including vector and parallel processing computer power. *Scientific computing is crucial to missions such as designing nuclear weapons, predicting global climate change, and conducting fundamental research. It also provides essential underpinnings for such emerging missions as enhanced oil recovery and artificial intelligence.*

- ***Advanced Manufacturing and Process Technology***. The DOE labs have extensive experience in assembling multidisciplinary research teams to address various technological challenges particularly in support of national security and energy needs. Teams have drawn on competencies in engineered materials and processes; engineering sciences; electronics and microelectronics; high-performance computing; rapid prototyping and testing; reliability physics and engineering; process characterization; and modeling and systems integration. Strengths in microelectronics, photonics, reliability engineering, materials and process development, and modeling have resulted in multimillion dollars of cooperative research and development agreements with segments of the U.S. semiconductor industry. *These production processes provide a technical and management foundation for the laboratories to make a significant impact on U.S. competitiveness through industry-driven initiatives*.

- ***Biosciences and Biotechnology***. These integrated and multidisciplinary capabilities enable development, use, and understanding of living organisms for genomics, structural biology, bioinstrumentation, health risk assessment, bioremediation, bioprocessing of fossil fuels, conversion of biomass to fuels and chemicals, biological solar energy conversion, and bioprocess engineering. The DOE laboratory complex contains an array of unique facilities that support biotechnology R&D, including synchrotron light sources, neutron sources, biomedical imaging systems, bioprocessing research facilities, transgenic mouse facilities, chromosome processing resources, clone libraries, and databases. The competency is built on expertise in biological, health and environmental sciences, chemical and physical sciences, engineering, instrumentation and high-performance computing. *This set of capabilities can promote human health, enhance environmental quality, develop more secure and safer energy sources, and improve the competitiveness of U.S. biotechnology firms*.

- ***Advanced Energy Technologies and End-Use Applications***. The laboratories possess expertise in a wide range of energy supply and end-use technologies including policy and risk analysis and energy, environmental, and economic modeling. In particular, the DOE labs constitute the world's leading resource in advanced nuclear energy technologies, including advanced fission reactors, space nuclear power, atomic-vapor laser isotope separation, and both inertial and magnetic fusion. The laboratories have provided the technical basis for commercial use of solar thermal, solar photovoltaic, wind, biomass and other forms of renewable energy sources and are developing energy storage technologies, supercapacitors and chemical fuel cells for automotive use, and cleaner fossil-fuel energy cycles. Also, lab-based superconductivity pilot centers work with industry to promote commercialization of high-temperature superconductors. *For the most part, these efforts could not exist outside the environment of multidisciplinary institutions such as the DOE Laboratories*.

- ***Environmental Science and Remediation Technology***. This emerging core competency is defined as characterizing, evaluating, and monitoring the environment as a complex system. It includes remediating past and present environmental insults and ensuring future environmental sustainability. Capabilities supporting environmental technology include earth sciences and engineering (atmospheric, oceanic, land surface and subsurface); chemistry and chemical engineering; physics; biology; materials; advanced computation and simulation; molecular sciences; robotics; societal phenomena; and information management. The labs take a broad-based approach to this work, ranging from fundamental science programs to technology development. *Maintenance of these capabilities will contribute to the national welfare by reducing the cost of environmental restoration and waste management at DOE sites, as well as at other federal agencies and industry. It also will significantly expand new scientific knowledge and contribute to a cleaner environment*.

- ***Nuclear Science and Technology***. This category includes a broad spectrum of disciplines, technical capabilities, and facilities essential to DOE's national security and civilian research missions. Unique strengths include nuclear and thermonuclear physics and the physical models and experimental capability necessary to model and verify complex phenomena. Applications include inertial fusion for civilian and military applications and magnetic fusion for energy production. Underlying capabilities include plasma physics, radiation transport, interactions with matter at extreme states, three dimensional hydrodynamics, and instrumentation and diagnostics for extremely fast, high-energy events. High-energy and nuclear physics programs encompass the fields of elementary particle physics (which strives to understand the basic structure of matter and fundamental forces) and nuclear physics (which studies how these particles and forces combine to form nuclei). This competency also encompasses physics, chemistry and technology of light, medium, heavy and transactinium radioactive materials, nuclear safety, security, intelligence and power applications. These capabilities are essential to the future DOE security mission in nonproliferation, dismantlement, safety, security, and stewardship of nuclear materials.

- ***Integrated Defense Science and Technology Competencies***. These enabling technologies and competencies, required for nuclear weapons development and testing, remain critical to maintaining nuclear deterrence and to guarding against nuclear weapons proliferation. Numerous spinoffs serve the commercial world. For example, seismology theory and instrumentation -- highly refined for nuclear weapons testing -- remain important for detecting treaty violations. And advances in the science are important for predicting volcanic action, understanding earthquakes, and for oil and mineral exploration. Other examples include electronics, navigation, computer science, aerodynamics, control of nuclear weapons and materials, atmospheric and other environmental sciences, accelerators, advanced manufacturing, and system engineering and rapid prototyping. The infrastructure provided by this competency allows an unequaled capability for solving complex problems of national importance in defense and industry.

C. Guide to Core Technical Capability Data Charts

The following pages provide data on the core technical capabilities of the Department's nine multi-program laboratories and the National Renewable Energy Laboratory. The information is provided in seven different measurement categories, with four pages of data per category. The measurement categories are listed below. The first three of each four-page set of data catalogues information according to the eight core technical capabilities described above. The fourth page in each four-page set captures data about five additional core technical capabilities for specific laboratories, plus a category labeled "other" which represents laboratory strengths that did not fit within the established core capability definitions.

1. ***Operating Dollars***: Data is for Fiscal Year 1993, based on Budget Authority provided by Congress. Operating budgets do not include construction funds.

2. ***Full-time Equivalent Employees***: Total staff, by core capability category, at end of Fiscal Year 1993.

3. ***Replacement Value of Facilities***: Data covers only those major facilities valued at greater than $25 million. Replacement cost based on rebuilding the facility on a "green field" site, without derivative utilization of other established buildings.

4. ***CRADAs with Industry***: The total number of Cooperative Research and Development Agreements from 1989 through the end of 1993. Approximately 600 CRADAs existed at the end of 1993. As of October 1994, the number had grown to more than 1000.

5. ***Value of CRADAs with Industry***: This chart provides cost-shared value of the operational CRADAs in effect at the end of Fiscal Year 1993.

6. ***Patents and Licenses***: For the year 1993, approximately 500 new U.S. patent applications were filed based on laboratory innovations and 410 licenses were awarded.

7. ***R&D 100 Awards***: These awards are given annually by R&D Magazine to institutions, both public and private, for innovations which have a significant prospect for commercial success. The data covers the award-winning technologies at the laboratories over the period from 1989 through 1993.

D. The Ten National Laboratories Reviewed by the Galvin Task Force

1. Argonne National Laboratory (ANL), Illinois

ANL is a multi-disciplinary R&D facility capable of conducting both large- and small-scale projects. Its wide ranging scientific and technical expertise often is called on to attack challenges ranging from nuclear non-proliferation to industrial technologies to basic research. The 4,800-member Lab staff aggressively pursues collaborative, technology-transfer partnerships with industry, university, and with other federal labs and agencies. Among ANL's core competencies are:

- ***Large Accelerator based User Facilities***: Design, team-building, construction, and operation of large accelerator-based user facilities, with emphasis on involving the user community in the total process -- such Lab-user partnerships often are guided by boards made up of members of industry, academia, and government.

- ***Nuclear Reactor Technology***: ANL is the only U.S. publicly funded institution with comprehensive skill in design and operation of nuclear reactors and related fuel cycle facilities. This competency is supports the development of reactor and fuel cycle technologies, safety engineering, design of reduced enrichment fuels, and operation and training for reactors overseas.

- ***Environmental Science and Technology***: Programs are devoted to R&D on advanced characterization and remediation technologies, and substantial work supporting site clean up for the DOE complex. ANL partners with Midwest manufacturers to address environmental issues, waste minimization, energy storage, and transportation technologies. ANL also is a full member in the national multilaboratory partnerships with the automotive and textile industries.

- ***Materials Research / Superconductivity***: ANL hosts the largest federally funded materials research program in superconductivity. As one of three DOE pilot centers for the commercialization of superconductivity, ANL conducts extensive research with industry, focusing on components for electric power systems.

Argonne's world class user facilities include the:

- Advanced Photon Source,
- Intense Pulsed Neutron Source,
- Argonne Tandem Linear Accelerator System
- Structural Biology Center, and
- High Performance Computing Research Facility.

2. Brookhaven National Laboratory (BNL), New York

BNL was founded in 1946 by nine Eastern universities which needed a convenient user facility where projects too large for any one of them could be built and operated. The Lab and its 3,500-member staff have been fulfilling that need ever since. BNL conducts basic and applied research on problems ranging from the top quark to superconductivity and from global change to advanced radiation therapy. BNL's major facilities and their competencies are:

Alternating Gradient Synchrotron (AGS): The AGS is a proton and heavy ion synchrotron with a maximum energy of 33 GeV and the highest flux of any accelerator of this energy. Three Nobel prizes, the discovery of CP violation in K decays, the discovery of the muon neutrino, and the discovery of the J/psi particle were awarded for work done at the AGS. A fourth, for the suggestion of parity violation, was made for work carried out at AGS during 1956.

- Relativistic Heavy Ion Collider (RHIC): RHIC is a storage ring in which counter rotating beams of heavy ions, injected from the AGS, will collide and produce the density and temperature of nuclear matter characteristic of the early stages of the universe. It will be ready for experiments in 1999.

- High Flux Beam Reactor (HFBR): The HFBR is a 60 Megawatt reactor designed to maximize the flux of neutrons for neutron scattering experiments, mostly in condensed matter. Neutrons are a unique, nondestructive tool for probing magnetic materials, crystal structure of materials containing light elements, vibrational modes in solids, and the interior of solids. There are more than 270 users of the HFBR in areas such as condensed matter physics, biology, chemistry, applied science, and industrial applications.

- National Synchrotron Light Source (NSLS): NSLS is two electron storage rings which provide X Ray, ultraviolet, and infra red beams for research in materials science, biology, chemistry, medical, and industrial applications. There are over 3400 users, including scientists from universities, industry, and other government laboratories.

Other facilities include the Positron Emission Tomograph (PET) which uses positron decays to produce images of the brain, and STEM, a scanning transmission electron microscope which is unique in its capabilities. These facilities are used not only by outside users but also by BNL researchers.

3. Idaho National Engineering Laboratory (INEL), Idaho

INEL includes more than 890 square miles of remote, accessible terrain, well-suited for development, demonstration and operation of complex processes. The Lab's 7,400-member staff represents the largest concentration of technical professionals in the region. INEL is recognized internationally for integration of engineering, applied science and operations to meet critical needs associated with energy supply, environmental management, national security and advanced technology development and demonstration. INEL's core competencies are:

- Systems Integration and Engineering: INEL discerns the future impacts, requirements, and potential problems associated with each of its major programs. The Lab's demonstrated skill in this are has resulted in more than 45 years of safe, environmentally conscious and cost effective operations. INEL has developed and operated 52 unique nuclear reactors, and contributed extensively to the safe applications of this technology in both the commercial power and national security sectors.

- Complex Process Development, Demonstration, and Operation: INEL efficiently move technical ideas from concept to operational status. A wide variety of prototype development and demonstration projects in support of environmental technology applications, renewable and alternative energy systems, advanced transportation concepts, advanced manufacturing methods, and non-proliferation technology applications have been successfully undertaken. Applying this core competency is evidenced by the successful operation of (a) major test reactors, including the Advanced Test Reactor, (b) chemical processing facilities, such as the Idaho Chemical Processing Plant, (c) manufacturing facilities, such as the Specific Manufacturing Capability Facility, and (d) commercial processes, such as automated welding. Capabilities required to design, construct, integrate, and operate such facilities are unique within the DOE complex, because of the breath of applications and the magnitude and complexity of facilities. INEL infrastructure, project management skills, systems integration, and engineering support provide the necessary ingredients for new and expanded missions in this area.

- Environmental Technology Development and Waste Management: INEL has pioneered in developing and providing methods for characterizing, treating and storing radioactive and hazardous waste, including high- and low-level waste treatment technologies. INEL's leadership in environmental technology and waste management result from a unique integration of capabilities including remote handling, biological and chemical processing, instrumentation and sensors, and earth and environmental sciences. INEL's competencies in systems integration and engineering, and in complex process development, have provided the foundation for meeting all environmental-related "records of decision" and supporting milestones on schedule, while maintaining the lowest cost in the laboratory system.

INEL is marked by an emphasis on applied science and engineering to bridge the gap between basic research and practical application, culture oriented toward providing maximum value to customers, proven ability to leverage environmental capability to regional natural resource industries, and unique infrastructure enabling a full range of design, development, demonstration and operations.

In addition, INEL continues to cost effectively leverage limited programmatic resources through a variety of partnership arrangements to facilitate transfer of technology to the private sector.

4. Lawrence Berkeley Laboratory (LBL), California

LBL's dedication to scientific excellence has garnered a host of awards -- including nine Nobel prizes. Its close connection with the University of California at Berkeley permits the lab and its 2,700-member staff to be especially aggressive in educating future scientists and engineers as well as improving the quality of K-12 science education. LBL core competencies include:

- ***Advanced Materials, Synthesis, Characterization and Processing***: Fundamental research here led to the development of detectors based on high-temperature superconducting materials, advances in nuclear magnetic resonance, nanoscale materials for energy applications, basic knowledge of chemical reactions in combustion, and surface-science research.

- ***Advanced Computing, Modeling and Simulation***: Activities include programs in three gigabit network testbeds; developing systems such as digital video analysis; research on economical paths to high-volume, high-speed data storage; and Internet-based multimedia applications for worldwide network-independent teleconferencing.

- ***Advanced Manufacturing and Process Technology***: LBL leads the Automation Technical Area within AMTEX, a partnership with the integrated U.S. textile industry. Other programs involve advanced lithography, and micro-electromechanical systems which apply processing techniques developed for semiconductors to the design of microscopic sensors, actuators, and motors

- ***Biosciences and Biotechnology***: Activities include the rational design of pharmaceuticals; research on coronary artery disease; the biology of breast cancer; advanced imaging techniques like tritium NMR, high-resolution positron emission tomography, and radiopharmaceutical chemistry; transgenic mouse facility for testing atherosclerosis treatments and for on-going clinical hereditary studies; genomic DNA sequencing supported by development of automated instrumentation; lipoprotein and atherosclerosis research program.; and a hematopoiesis program.

- ***Nuclear Science and Technology / High-Energy and Nuclear Physics***: LBL supports research in the nuclear and chemical properties of the heaviest elements; leadership in the STAR experiment at Brookhaven's Relativistic Heavy Ion Collider; participation at Fermilab includes CDF and D0 detector collaborations; originating the technical basis and now partners in the B-Factory at SLAC; astrophysics programs including a search for distant supernovae, direct detection of dark matter, investigations of the cosmic microwave background and the Sudbury Neutrino

Observatory. This research is supported and complemented by premier programs in designing and building particle detectors and in many areas of accelerator physics and technology, including design and analysis, superconducting materials and magnets, and beam electrodynamics.

- ***Advanced Energy Technologies & End-Use Applications***: Programs include development of inertial-confinement fusion energy; gas and oil recovery and geothermal resources; energy efficiency; and creation of technologies, processes, and analytical methods in building technology, transportation, utilities, industry, and policy development.

- ***Environmental Science & Remediation Technology***: LBL research is aimed at understanding the formation, transport, transformation, mitigation, and ecological effects of pollutants on the environment including research in fractured porous systems such as soil and rock; advanced site-characterization, remediation, and separation methods for use at contaminated sites or sites with special geologic interest; subsurface barrier technology; methods for removing and recovering toxic metals from aqueous waste streams; hazards of the indoor environment including radon and other indoor air pollutants; research on climate change; and fundamental actinide chemistry and processes that impact environmental remediation and restoration.

Among LBL national research facilities are:
- The Advanced Light Source,
- The 88-Inch Cyclotron,
- The National Center for Electron Microscopy, and
- The National Tritium Labeling Facility.

5. Lawrence Livermore National Laboratory (LLNL), California

LLNL and its 7,900-member staff focus their efforts on global security, global ecology, and bioscience. LLNL offers a demonstrated ability to apply science and technology effectively on a large scale, thanks to a broad culture of diverse disciplines and well-developed links to industry and the university R&D communities. Core competencies and characteristics include:

- ***Nuclear Science***: LLNL is one of two nuclear weapon design laboratories and has applied this knowledge to fusion and nuclear energy, atomic (x ray) and nuclear physics, and astrophysics. The Lab serves as an expert resource on international nuclear weapon and nuclear materials issues.

- ***Computation***: LLNL operates several supercomputer centers, including the DOE's national supercomputer center and network, and the national information storage laboratory. The Lab deployed the first machines of many generations of new computers; developed scientific computation, operating, and system control languages; pioneered time sharing and network management; and is engaged in the national effort to develop massively parallel computational capabilities.

- ***Lasers***: The LLNL world-leading laser program is very directed, developing lasers which have specific applications -- adding to the national capability in glass lasers, metal vapor and dye lasers, and now solid state diode lasers. The Lab has adapted these technologies to astronomy, satellite systems, biology, and advanced manufacturing.

- ***Instrumentation and Sensors***: Instrumentation and sensor capabilities derive initially from the critical and demanding needs of weapons testing. The requirements for laser, biology, environment, and energy systems and for precision engineering have further evolved this capability.

- ***Bioscience***: LLNL, one of the three DOE centers for the study of the human genome, has mapped most of chromosome 19 with sequenced, cloned DNA fragments and has helped locate 170 genes, 3 repair genes, and many biological functions and pathologies associated with this chromosome. In addition, Livermore is developing bioscience applications for healthcare, environmental cleanup, and energy conversion.

- ***Materials and Processing***: LLNL developed materials that are the lightest known solids, best thermal and electrical insulators, and with the highest toughness-to-weight ratio; fabricated materials an atomic layer at a time; built microstructures and micromachines; and, in collaboration with Russian scientists, increased the growth rate of optics crystals by 100 times. The Lab developed and uranium laser isotope separation (AVLIS); this is the nation's largest and most complex process technology transfer.

Among unique facilities at LLNL are the National Energy Research Supercomputer Center (NERSC); the world's most powerful laser (Nova); the laser isotope separation demonstration facility (AVLIS); the best instrumented hydrodynamics test facility (FXR); the country's most advanced energetic materials research facility (HEAF); the most precise diamond turning machine (LODTM) which cut metal mirrors for the Keck telescope; the electron beam ion trap (EBIT) capable of studying atomic structure of any element at extremely deep ionization levels; the nation's most productive and diverse center for accelerator mass spectrometry (CAMS); the nation's atmospheric release advisory capability (ARAC) which analyzed Chernobyl in real time; the national center for global climate model comparison; the genome research center; and environmental technology demonstration facilities for dynamic underground stripping, for groundwater cleanup, and for mixed waste treatment.

6. National Renewable Energy Laboratory (NREL), Colorado

NREL has a compelling mission: "[to lead] the nation toward a sustainable energy future by developing renewable energy technologies, improving energy efficiency, advancing related science and engineering, and facilitating commercialization." Further, NREL is the only DOE Laboratory solely dedicated to developing renewable energy technologies (RETs) and related energy efficiency technologies, which includes helping to build a viable industry. NREL's current technical staff of more than 500 represents the largest concentration of expertise focused on renewable energy technologies in the world. This highly trained staff is further augmented by unique experimental and user facilities.

To help meet its challenging mission, NREL carries out its activities using a process called vertically integrated research and development (R&D) and partnership development by working closely and in parallel with industry, university, and national lab partners, as well as other stakeholders, to evolve and develop technology of commercial interest through all its stages -- from basic research through applied research, engineering, product development, manufacturing support and, finally, in a supporting role, commercialization. These efforts rely heavily on four core competencies:

- Advanced Materials and Prototype Component Development
- Development and Characterization of Renewable Energy, Energy Efficiency, and Waste Conversion Processes
- Systems and Process Engineering and Integration for Renewable Energy and Energy Efficiency
- Establishing Partnerships for Market and Technology Development for Renewables and Energy Efficiency

In addition, as part of this vertically integrated process NREL, guided by a number of review and advisory boards made up of members of industry, academia, users, and institutions:

- Serves as the focal point for planning and implementing the federal RET R&D program in industry and universities;
- Technically evaluates and plans projects for the deployment of RETs and carries out DOE-assigned program management;

- Serves as the "corporate memory" to assure that lessons learned are applied to the next generation of RET projects;
- Develops collaborative relationships with research institutes abroad, leading to a better understanding of, and familiarity with, U.S. manufacturers and products;
- Transfers RET and related technology from the Laboratory to U.S. industry; and
- Provides scientific and technical information on a wide range of RETs to other agencies and industry.

7. Los Alamos National Laboratory (LANL), New Mexico

LANL is a world class laboratory which attracts and retains a high caliber staff of 7,600. The Lab also continually draws internationally renowned scientists, both foreign and domestic, from universities, industry, and government-funded laboratories. LANL competencies and distinguishing characteristics include:

- ***Nuclear Weapons and Materials***: LANL has exceptional broad capabilities, with several unique facilities including the Plutonium Facility, the Chemistry and Metallurgy Research Building, and the Critical Experiments Facility. They permit research, development, and demonstration of process technology, fabrication, safety and criticality studies, and waste treatment. Explosive and energetic materials capabilities extend from synthesis and characterization to pilot scale production to machining and fabrication to engineering and testing. Flash x ray capabilities allow imaging of dynamic events.

- ***Scientific Computing***: LANL has one of the two largest capabilities in this area, a capacity that allows the Lab a leadership role in addressing some of the nations grand challenges. An example is development of the parallel ocean model, a program that received the Computerworld Smithsonian Award for technical excellence in the science category. LANL is the site of one of two DOE High Performance Computing Centers, and supports the Computational Testbed for Industry, as well as the Los Alamos Neutron Scattering Center (LANSCE), a pulsed neutron source with a large and vigorous user community. Research activities cover the spectrum from materials studies to structural biology, and LANSCE is expected to play a key role in the proposed nuclear weapons stewardship initiative.

- ***Sensors and Diagnostics***: LANL is a leader in developing techniques for capturing transient signals under extremes of temperature and pressure. Sensors and diagnostics have been deployed in environments from subsurface to oceans to space. These capabilities play an important role in the growing area of non and counterproliferation, a national program in which LANL is a leader.

- ***Biology***: LANL has one of three DOE Centers for Human Genome Studies, which has earned international stature deriving largely from the interface that has been achieved between researchers in biology and those from the physical sciences, computation, and the engineering sciences.

8. Oak Ridge National Laboratory (ORNL), Tennessee

ORNL is a world-class, wide-ranging scientific R&D institution thanks to its technical accomplishments, outstanding staff, extensive facilities, diverse programs, and broad collaborations. The 5,100-member ORNL staff represents an unusually wide range of disciplines, and includes 1,500 scientists and engineers. ORNL hosts more than 4,000 guest scientists per year, representing 250 companies and universities, as well as over 20,000 students and several hundred teachers. ORNL core competencies include:

- ***Energy production and end-use technologies***: ORNL is one of the world's premier centers for R&D on energy efficiency and supply technologies and on the economic, social and environmental consequences of energy systems and processes. The Buildings Technology Center has the nation's most versatile capability for testing and analysis of building equipment and envelope systems.

- ***Biological and environmental science and technology***: ORNL offers unique capabilities for investigating pathways, fate and effects of anthropogenic materials in the environment, and has the only formal Protein Engineering Program within DOE. The Mammalian Genetics Facility is a unique national resource for genetics research.

- ***Advanced materials synthesis, processing, and characterization***: An extremely broad range of materials R&D is conducted, with particular excellence in high temperature ceramics and composites, metals and intermetallic alloys, superconductors, semiconductors, optical materials, and surfaces and thin films. The High Temperature Materials Laboratory is a unique and popular user facility for materials research.

- ***Neutron-based science and technology***: This competency includes the design and operation of research reactors, accelerators, and hot cells; neutron scattering; isotope production and research, materials irradiation and testing, neutron activation analysis, radiation chemistry, health physics and radiation effects, and nuclear medicine. Unique facilities include the High Flux Isotope Reactor (HFIR) and Radiochemical Engineering Development Center (REDC).

Supporting these core competencies are facilities and capabilities unavailable elsewhere, such as the:

- Holifield Radioactive Ion Beam Facility,
- Center for Computation Science (one of two such DOE centers).

9. Pacific Northwest Laboratory (PNL), Washington State

PNL and its 4,000-member staff are located on the Hanford Site, a factor which heavily influences the Lab's technical composition. PNL entered the DOE Multiprogram Laboratory System in 1986, well-positioned to shift focus from support of defense production to environmental issues and cleanup. DOE and PNL management committed to establish a world-class fundamental science base in bioscience, chemistry, chemical physics and process science, directly related to the nation's environmental problems. PNL possesses three core competencies:

- ***Integrated Environmental Research***: Key technical capabilities are in the fields of ecological sciences, hydrology, geochemistry/geophysics, atmospheric chemistry, chemistry and chemical physics, bioscience, economics and policy analysis, and computational sciences. PNL offers a proven ability to form large cross-disciplinary teams to address large-scale environmental issues. PNL leads the OHER Subsurface Science Program, the Atmospheric Radiation Measurement Program of the DOE Global Environmental Change Research Program, and is constructing the Environmental and Molecular Science Laboratory (EMSL) as a national collaborative research facility.

- ***Process Science and Engineering***: As the science and technology integrator at Hanford, PNL leads in Hanford's Tank Waste Remediation System and the National Tanks Program -- bringing to bear long-standing process skills related to defense-waste storage, treatment and packaging technology. This competency is highly coupled with the integrated environmental research competency because remediation and storage performance criteria must be based on scientifically sound standards governing environmental and biological risk. Technical skills are focused on chemical and physical characterization, tank safety, separations science, waste form development and performance, and systems engineering.

- ***Energy Systems Development***: Energy Systems Development is underpinned both by technology, and economic and policy analysis expertise. Historically, PNL has played key research roles in regional power issues, energy policy analysis, and more recently in technical areas of residential and industrial power usage, and power transmission and distribution systems. Distinguishing characteristics are exemplified by excellence in scientifically based economic models to address energy, agricultural, and ecological policy issues relative to global and regional environmental change.

10. Sandia National Laboratories (SNL), New Mexico

Sandia is a systems engineering laboratory. It was created in 1949 to team industrial management and government experience in the design of deployable nuclear weapons as well as the surety and reliability of the nuclear weapons stockpile.

Sandia is located in Albuquerque, New Mexico, and in Livermore, California, with the New Mexico site being the larger facility. Sandia operates a wide variety of technical and user facilities, the collection of which constitutes one of the world's premier research, development, and testing complexes. The staff of 8,500 employees performs work for DOE national security programs (about 50% of laboratory effort), DOE energy and environmental programs (about 25%) and work for other federal agencies (25%). Ninety percent of the work for other federal agencies is for DoD.

Sandia's core competencies include the following research foundations and integrated capabilities:

Research Foundations:

- ***Engineered Processes and Material***: The synthesis, characterization, and processing of metallic, ceramic, organic, and composite materials; advanced materials and processes tailored for specific applications.
- ***Computational and Information Sciences***: The development of advanced computing networks, computational methods for emerging computer technologies, mathematical techniques for information surety, and computer-based techniques for intelligent machines.
- ***Microelectronics and Photonics***: Materials growth and development, device design, fabrication technologies for silicon and compound semiconductor devices, and design of processes and equipment for the manufacture of integrated circuits.
- ***Engineering Sciences***: Fluid and thermal sciences, solid and structural mechanics, radiation transport, aerospace sciences, geoscience, combustion science, and the development of interdisciplinary capabilities.

Integrated Capabilities:

- ***Advanced Manufacturing Technology***: Leadership in advanced manufacturing to make continuing, critical, and valuable contributions to national security, energy security, environmental stewardship, and economic competitiveness.

- ***Electronics Technology*:** Leadership in electronics technology for defense and industry.

- ***Advanced Information Technology*:** Technology and systems for nuclear weapon programs, related mission assignments, other strategic thrusts, and national information initiatives.

- ***Pulsed Power Technology*:** High-power x-ray and gamma ray sources for a variety of applications, including nuclear weapon survivability testing, light-ion beam inertial confinement fusion, materials processing, waste and product sterilization.

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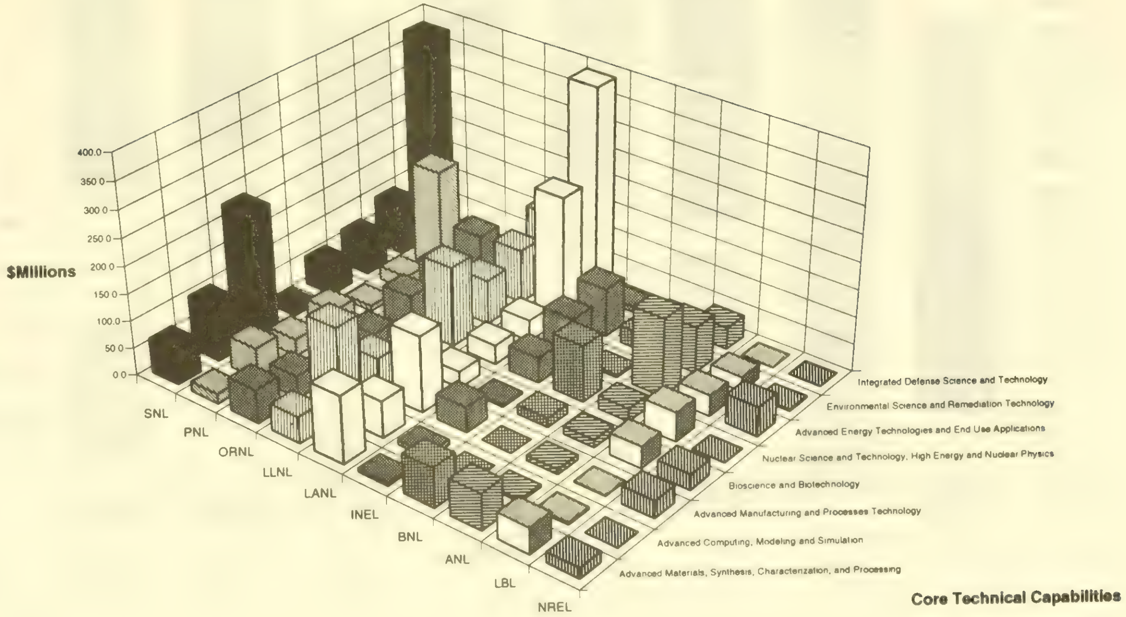
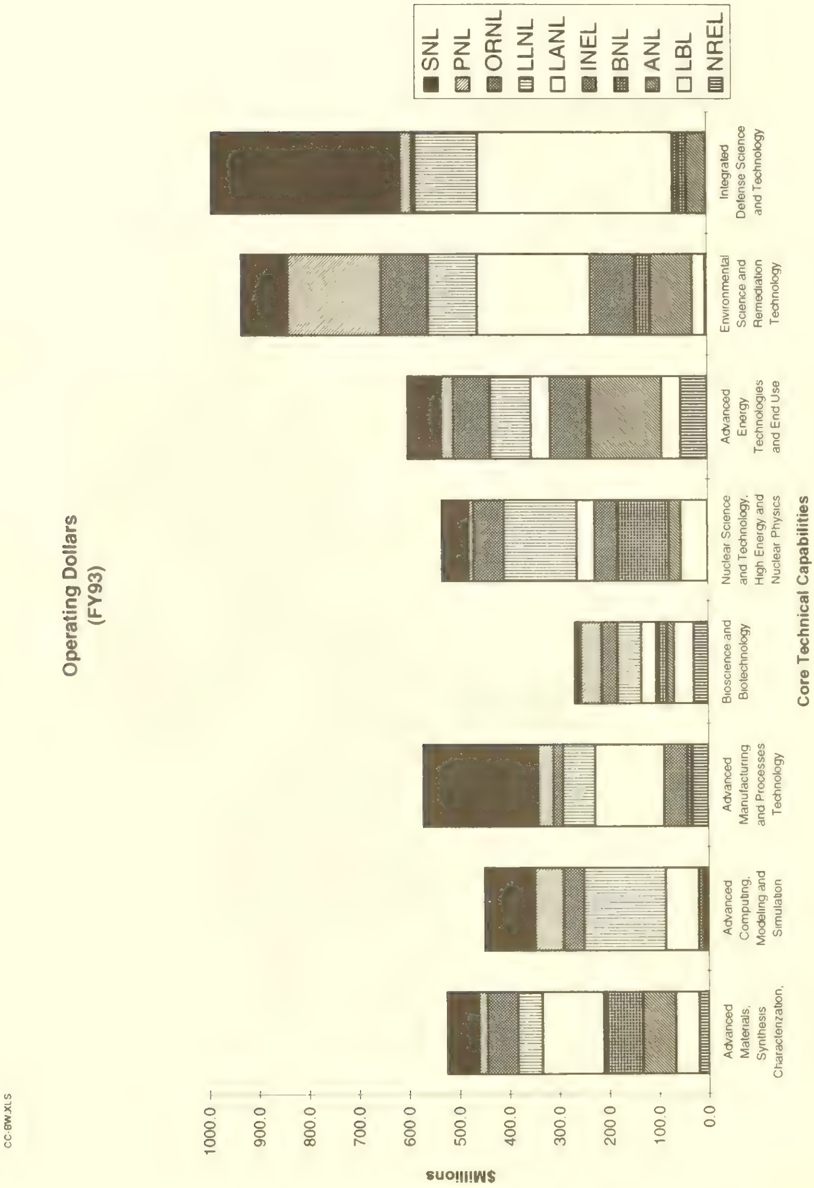
Operating Dollars
(FY93)




Operating Dollars
(FY93)
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100.0
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Advanced Materials, Synthesis Characterization,
Advanced Computing, Modeling and Simulation
Advanced Manufacturing and Processes Technology
Bioscience and Biotechnology
Nuclear Science and Technology, High Energy and Nuclear Physics
Advanced Energy Technologies and End Use
Environmental Science and Remediation Technology
Integrated Defense Science and Technology
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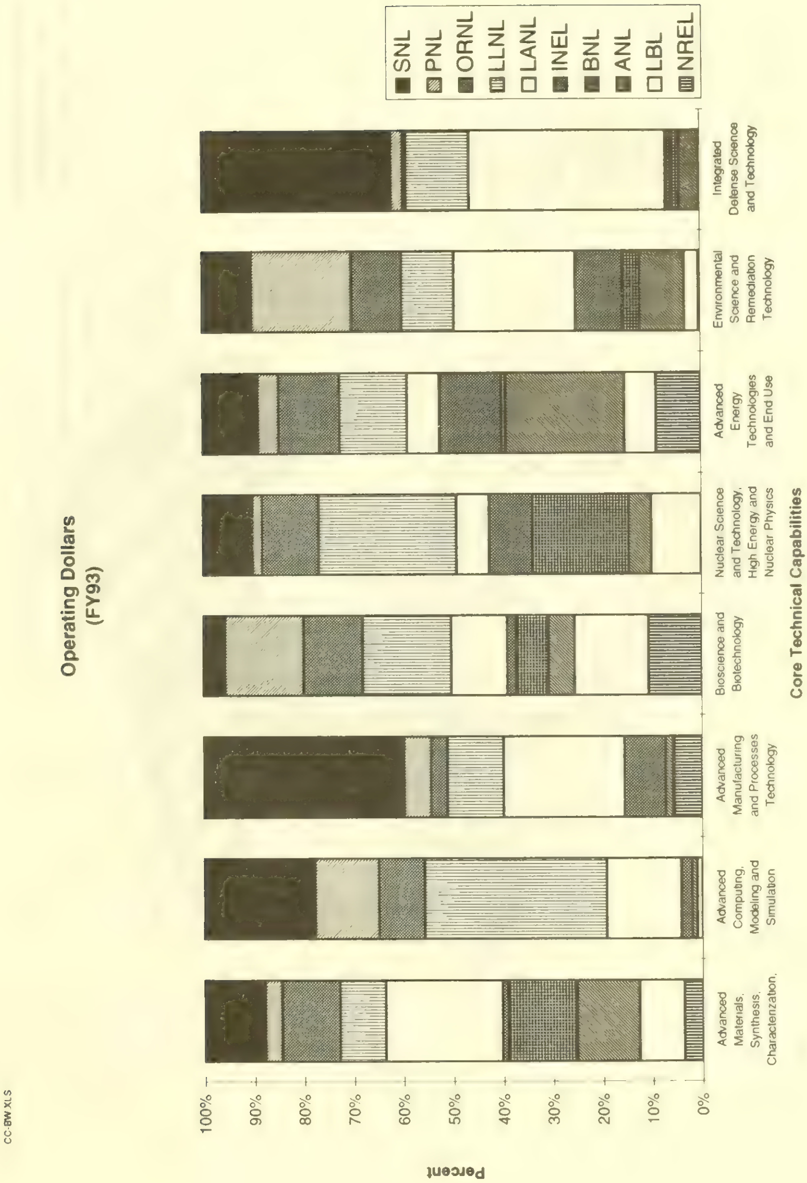
Operating Dollars
(FY93)
Percent
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Advanced Materials, Synthesis, Characterization.
Advanced Computing, Modeling and Simulation
Advanced Manufacturing and Processes Technology
Bioscience and Biotechnology
Nuclear Science and Technology, High Energy and Nuclear Physics
Advanced Energy Technologies and End Use
Environmental Science and Remediation Technology
Integrated Defense Science and Technology
Core Technical Capabilities
SNL
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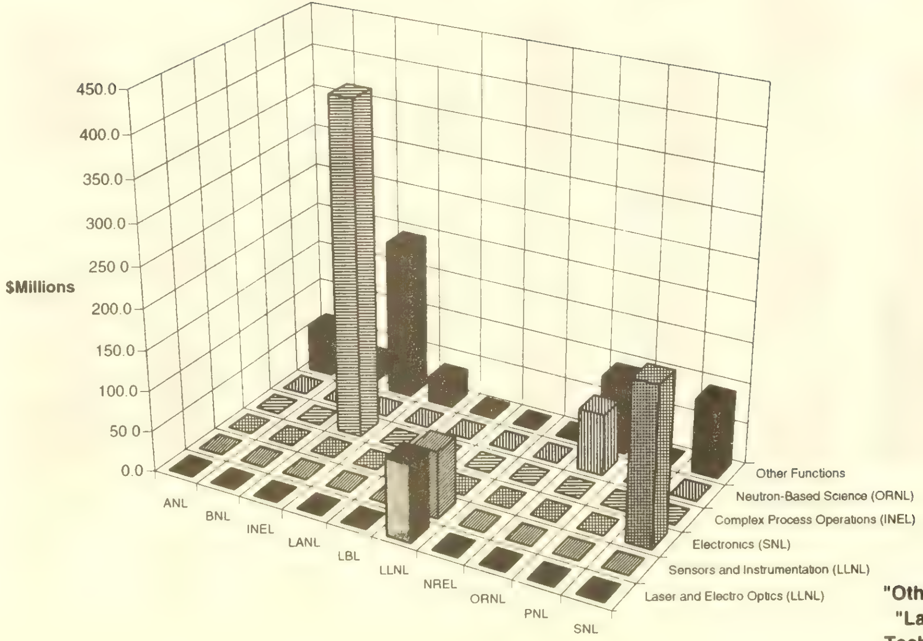
Operating Dollars
(FY93)



"Other" Functions and "Lab-Specific" Core Technical Capabilities

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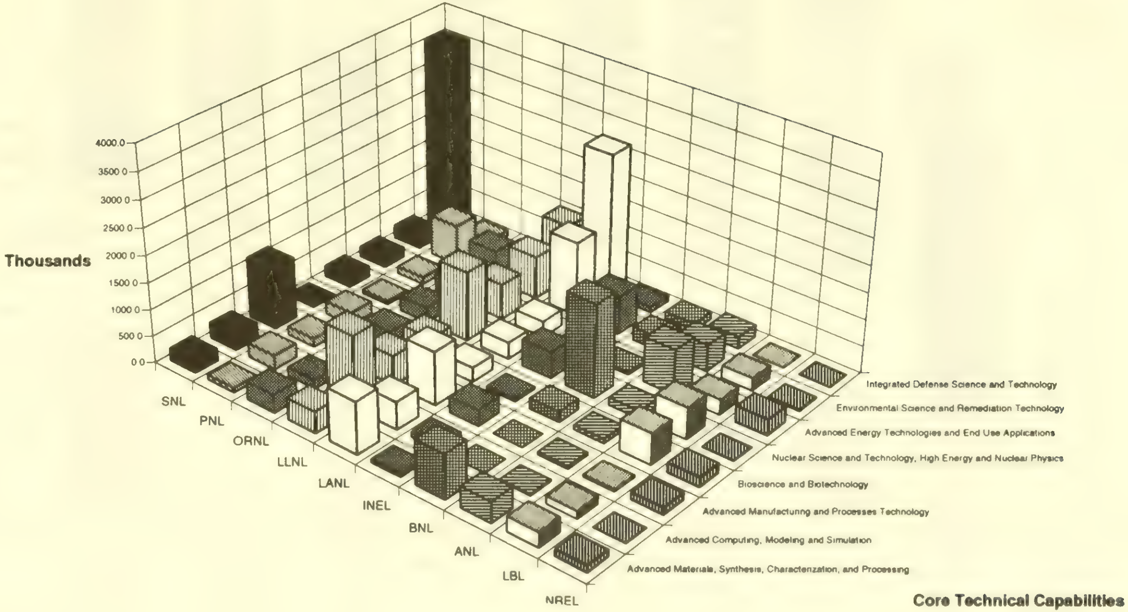
Full-Time Equivalent Employees
(FY93)



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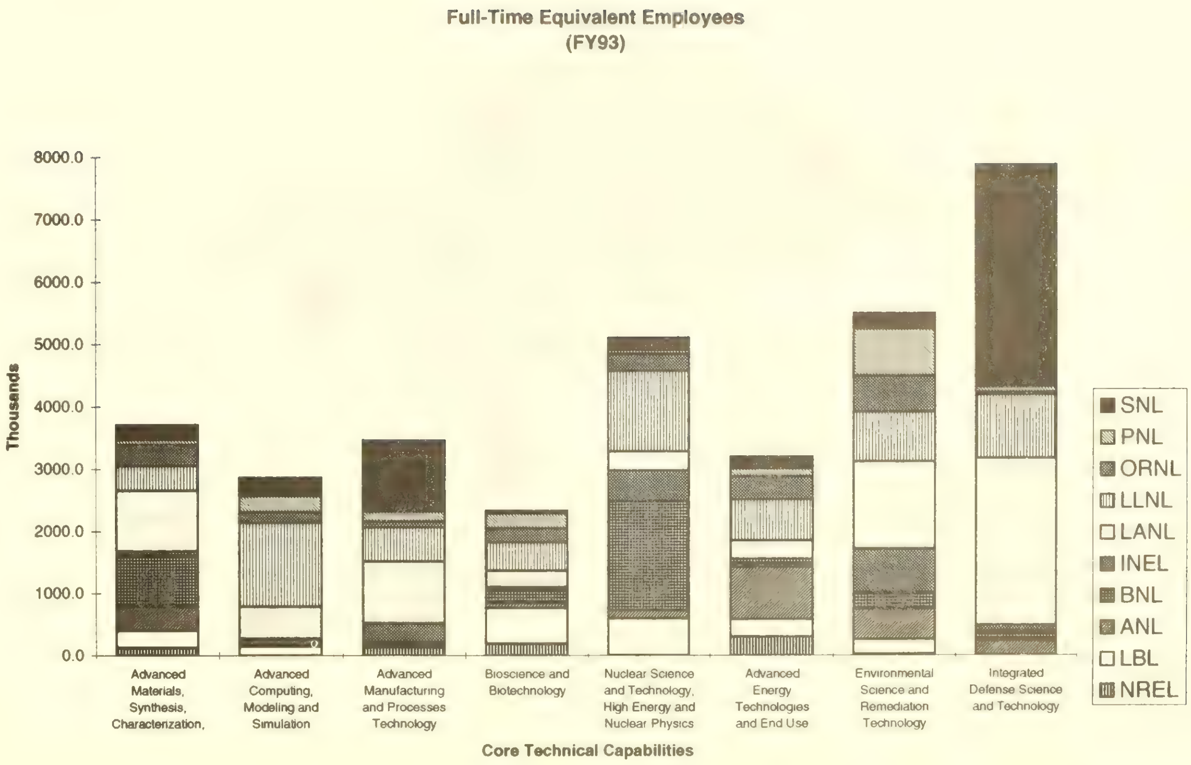
Full-Time Equivalent Employees
(FY93)
Thousands
8000.0
7000.0
6000.0
5000.0
4000.0
3000.0
2000.0
1000.0
0.0
Advanced Materials, Synthesis, Characterization,
Advanced Computing, Modeling and Simulation
Advanced Manufacturing and Processes Technology
Bioscience and Biotechnology
Nuclear Science and Technology, High Energy and Nuclear Physics
Advanced Energy Technologies and End Use
Environmental Science and Remediation Technology
Integrated Defense Science and Technology
Core Technical Capabilities
SNL
PNL
ORNL
LLNL
LANL
INEL
BNL
ANL
LBL
NREL
0

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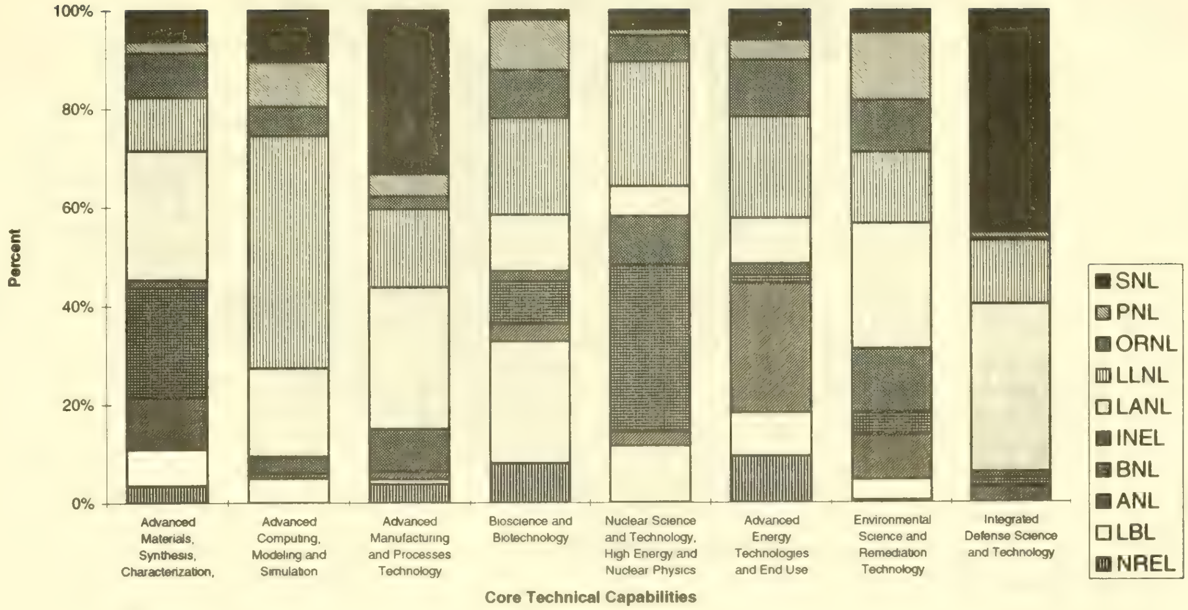
Full-Time Equivalent Employees
(FY93)



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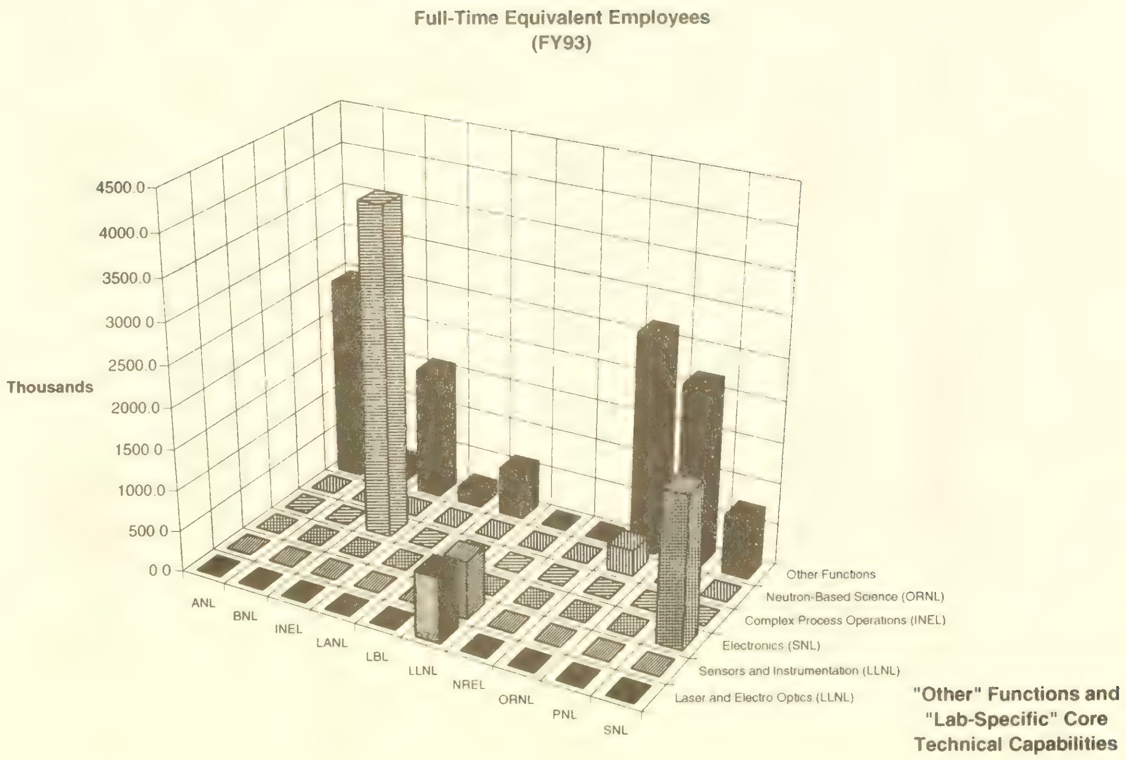
Full-Time Equivalent Employees
(FY93)
Thousands
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4000.0
3500.0
3000.0
2500.0
2000.0
1500.0
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0.0
ANL
BNL
INEL
LANL
LBL
LLNL
NREL
ORNL
PNL
SNL
Other Functions
Neutron-Based Science (ORNL)
Complex Process Operations (INEL)
Electronics (SNL)
Sensors and Instrumentation (LLNL)
Laser and Electro Optics (LLNL)
"Other" Functions and
"Lab-Specific" Core
Technical Capabilities

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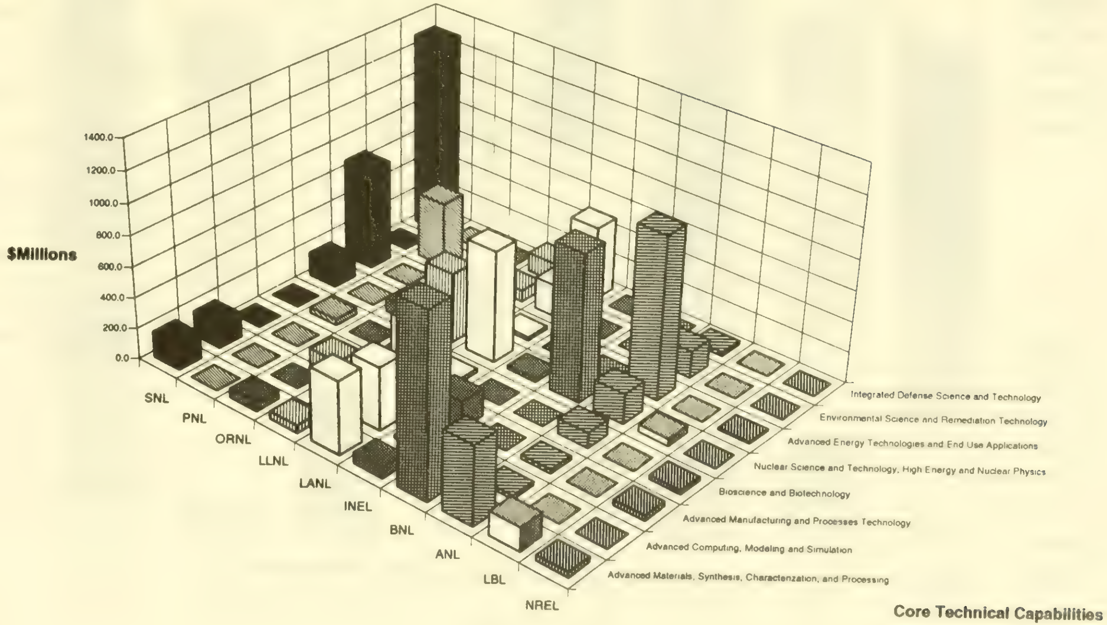
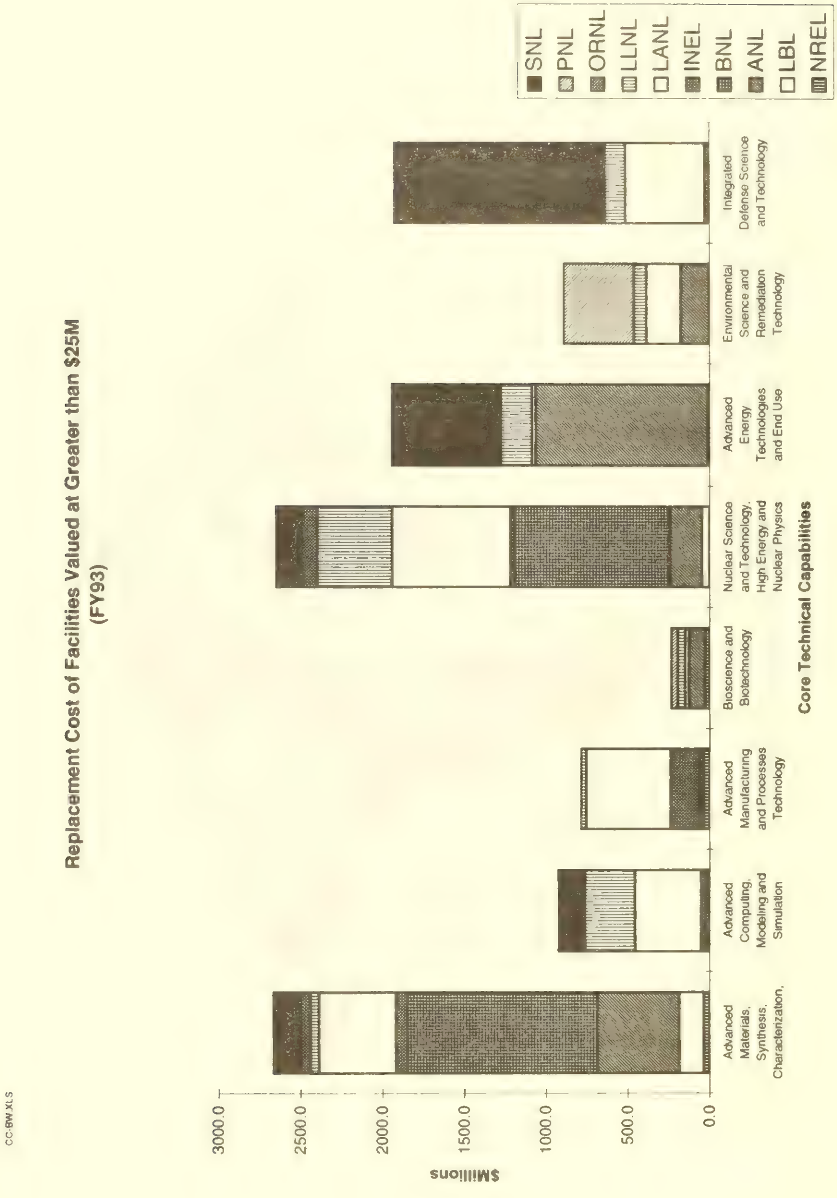
Replacement Cost of Facilities Valued at Greater than $25M
(FY93)

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Replacement Cost of Facilities Valued at Greater than $25M
(FY93)
$Millions
3000.0
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0.0
Advanced Materials, Synthesis, Characterization,
Advanced Computing, Modeling and Simulation
Advanced Manufacturing and Processes Technology
Bioscience and Biotechnology
Nuclear Science and Technology, Hgh Energy and Nuclear Physics
Advanced Energy Technologies and End Use
Environmental Science and Remediation Technology
Integrated Defense Science and Technology
Core Technical Capabilities
SNL
PNL
ORNL
LLNL
LANL
INEL
BNL
ANL
LBL
NREL

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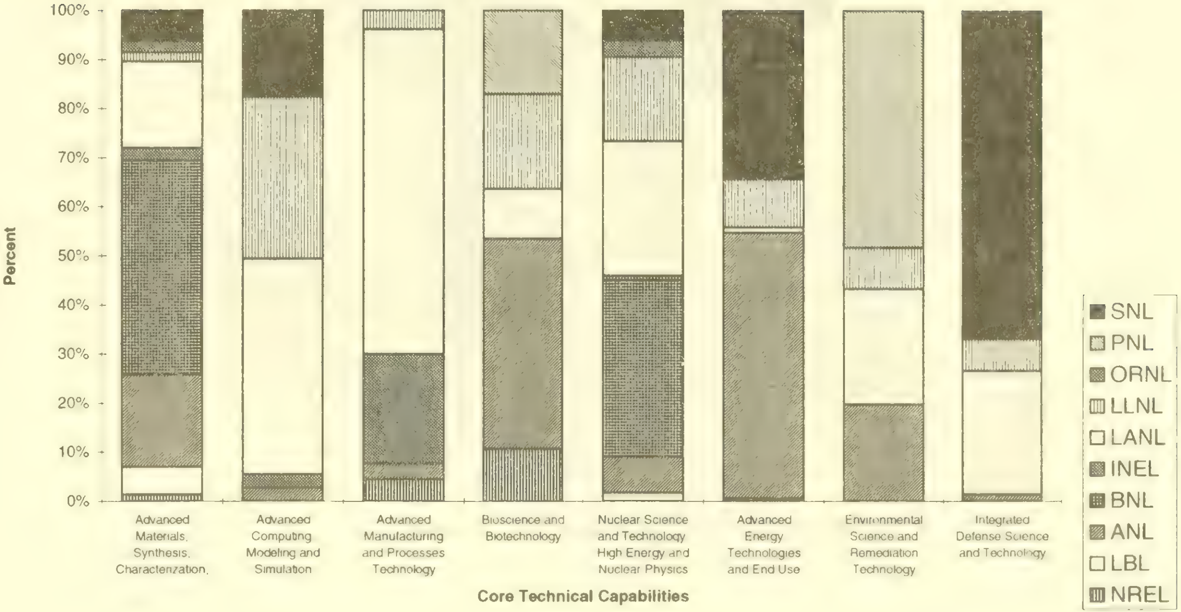
Replacement Cost of Facilities Valued at Greater than $25M
(FY93)



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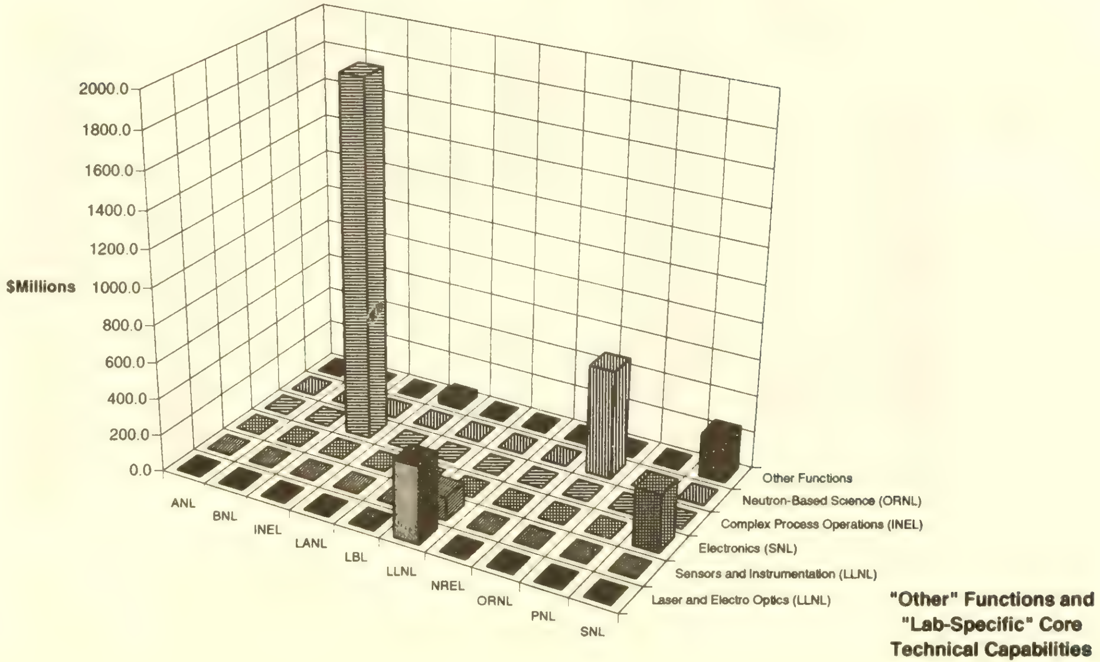
Replacement Cost of Facilities Valued at Greater than $25M
(FY93)



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CRADAs with Industry
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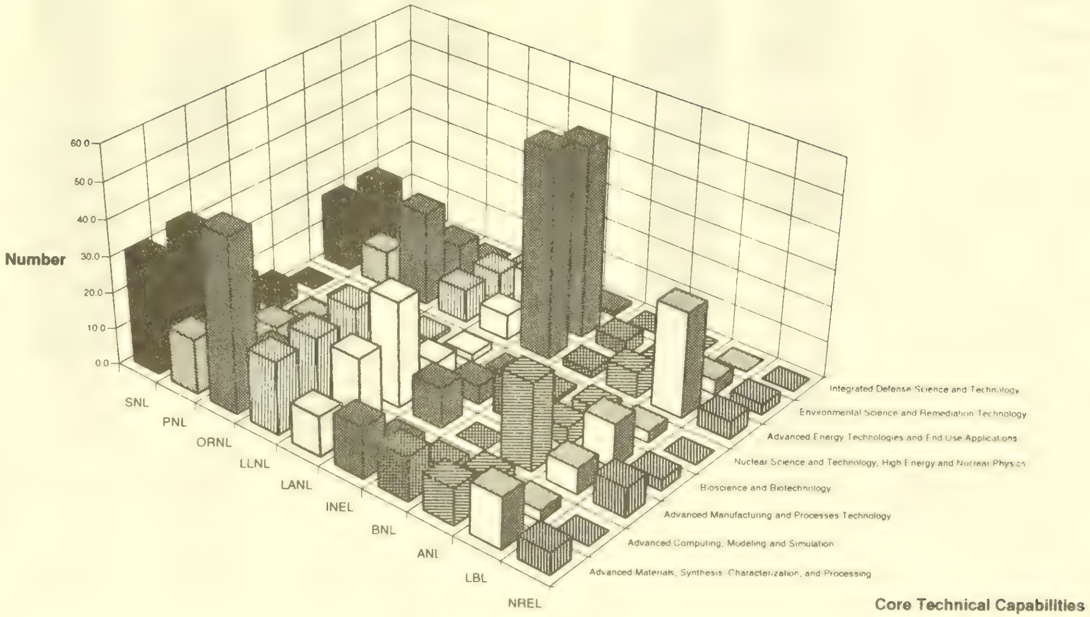

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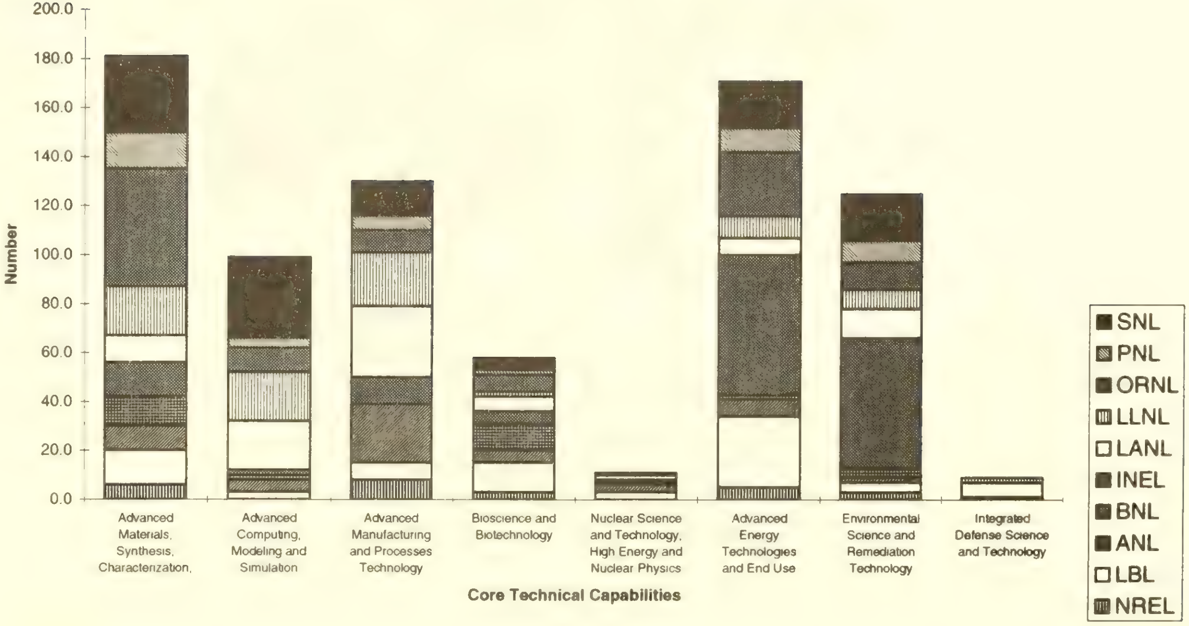

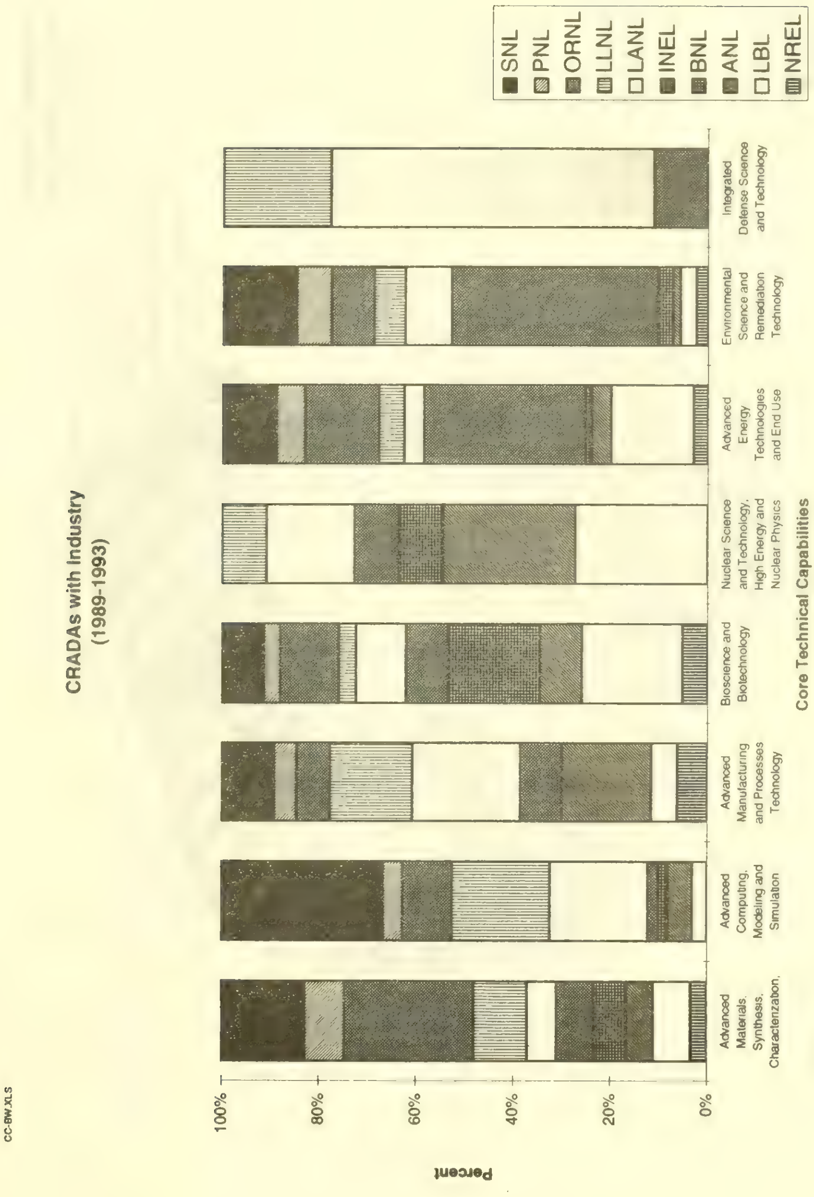

CRADAs with Industry (1989-1993)

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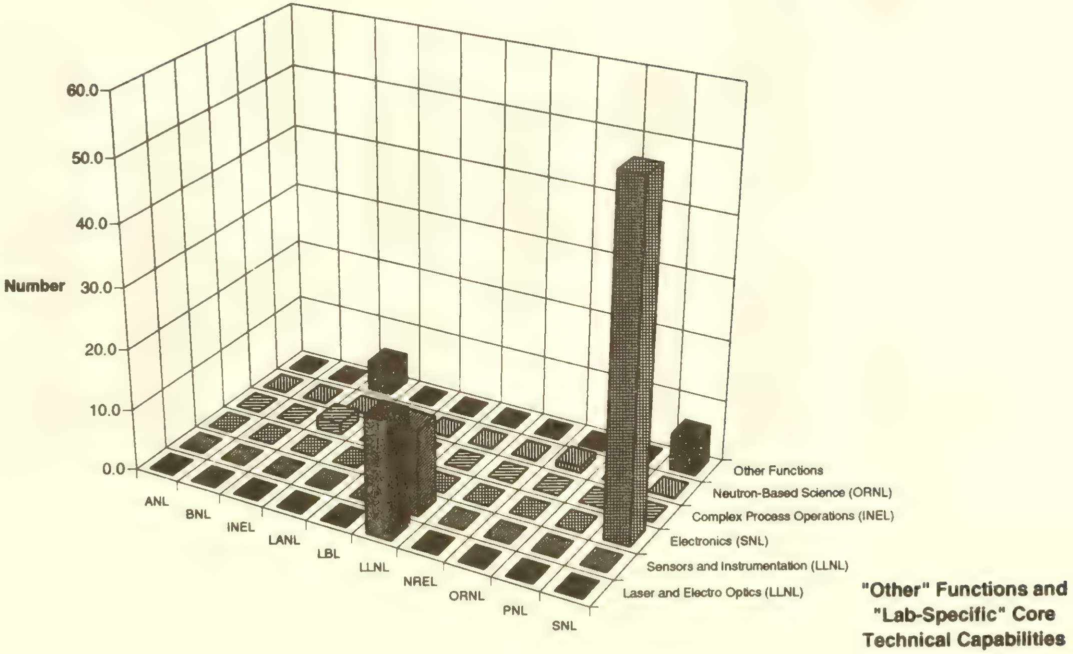
CRADAs with Industry
(1989-1993)



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Value of CRADAs with Industry
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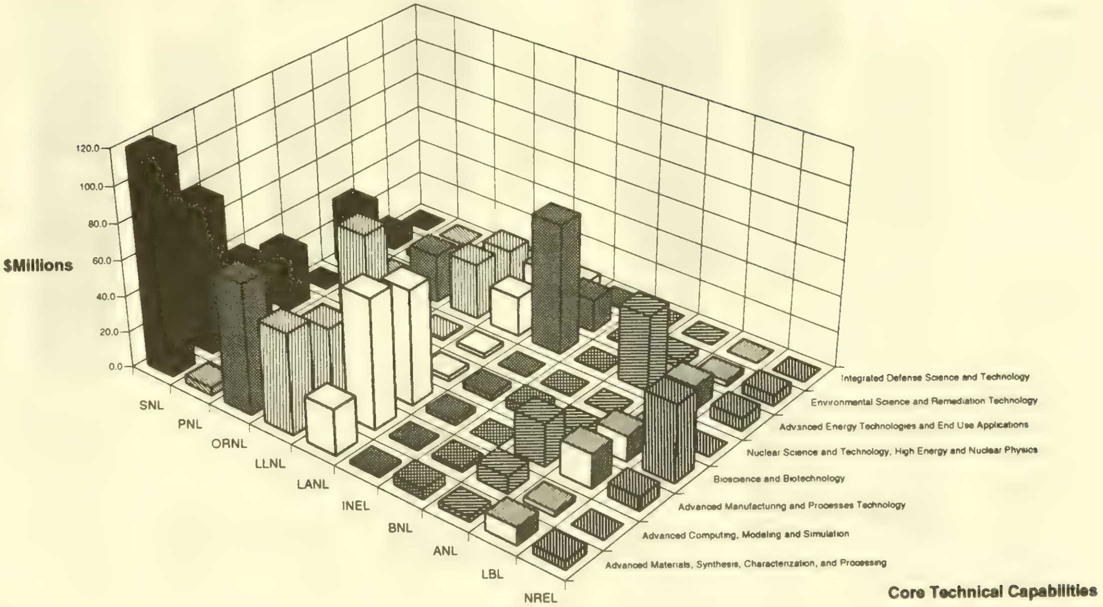

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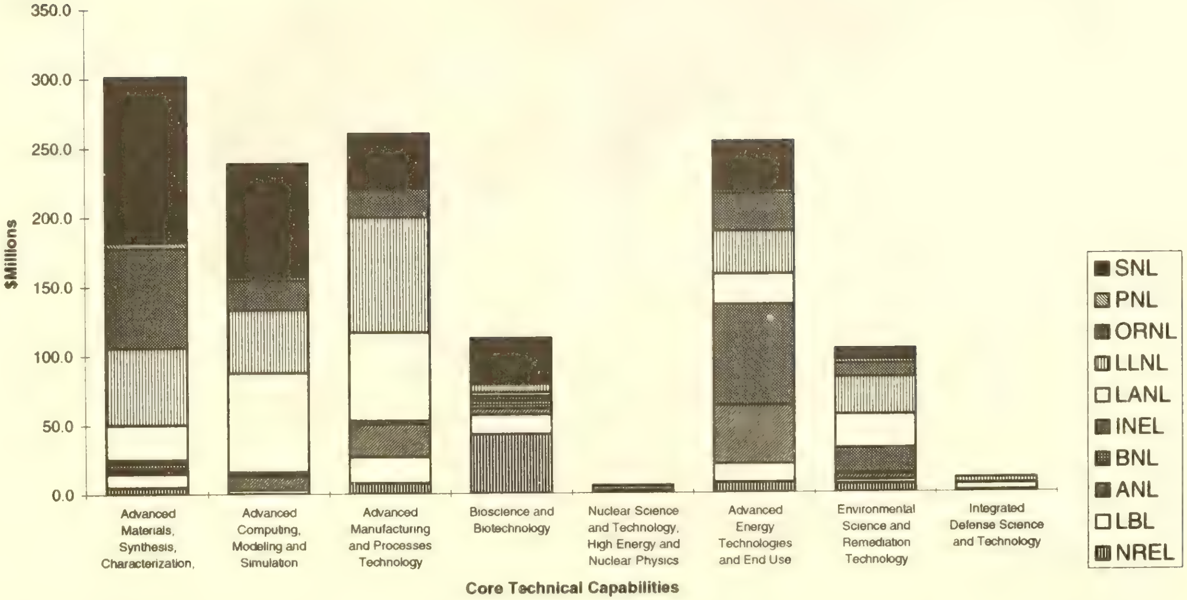
Value of CRADAs with Industry
(FY93)



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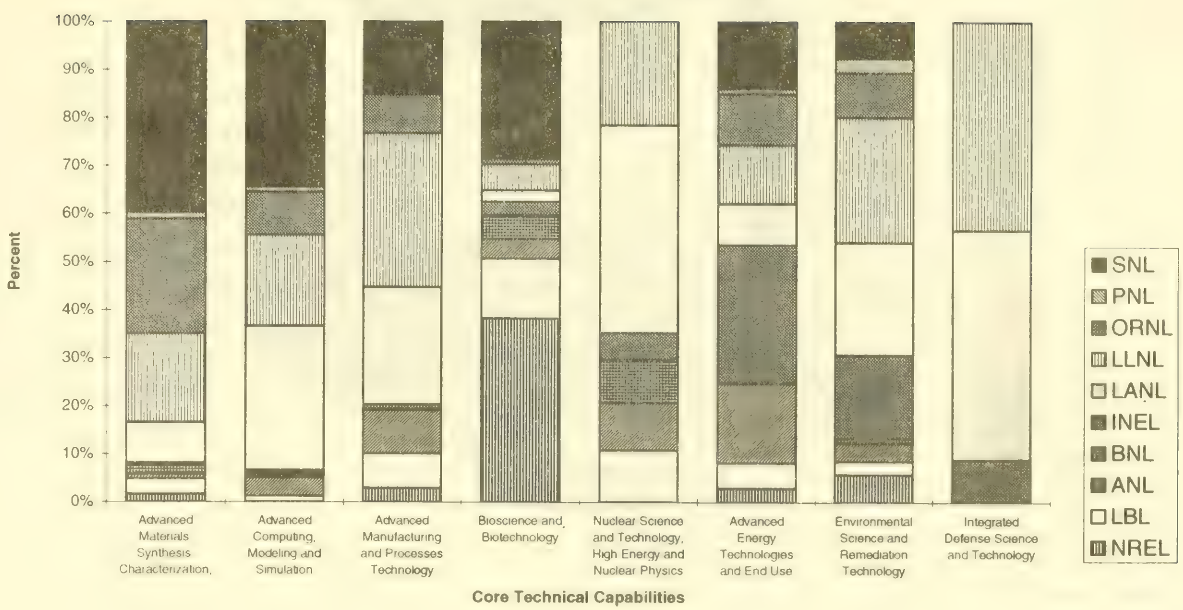
Value of CRADAs with Industry
(FY93)



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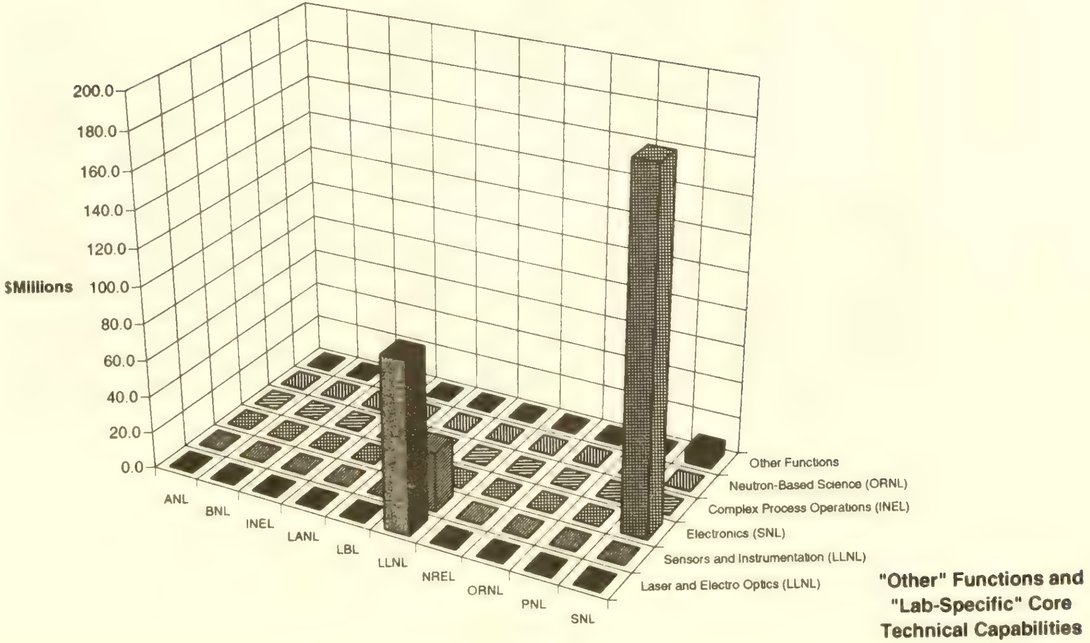
Value of CRADAs with Industry
(FY93)



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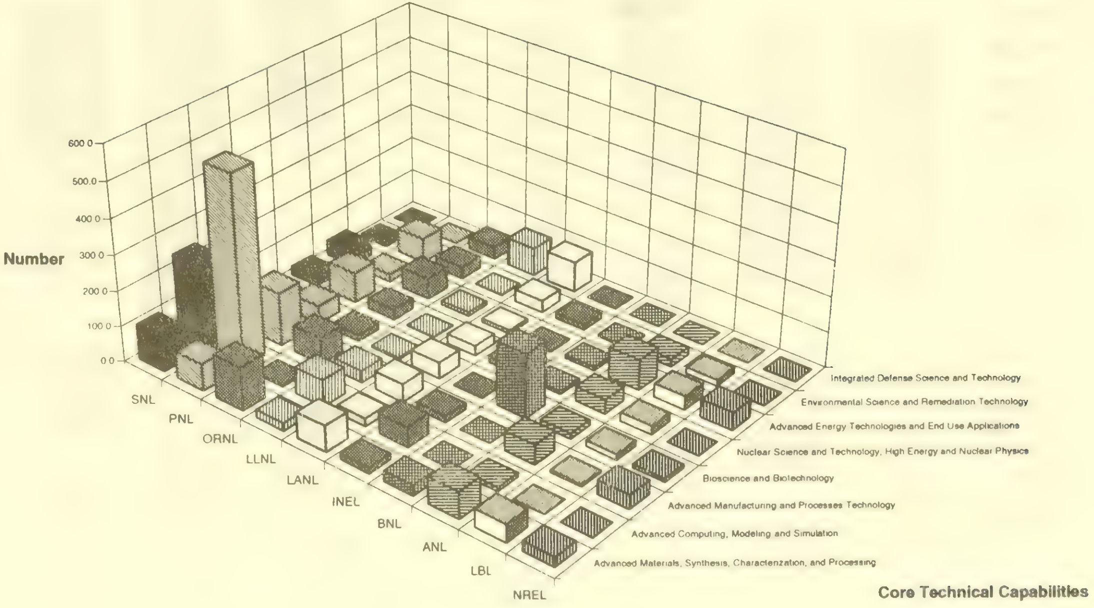
Patents and Licenses
(FY93)



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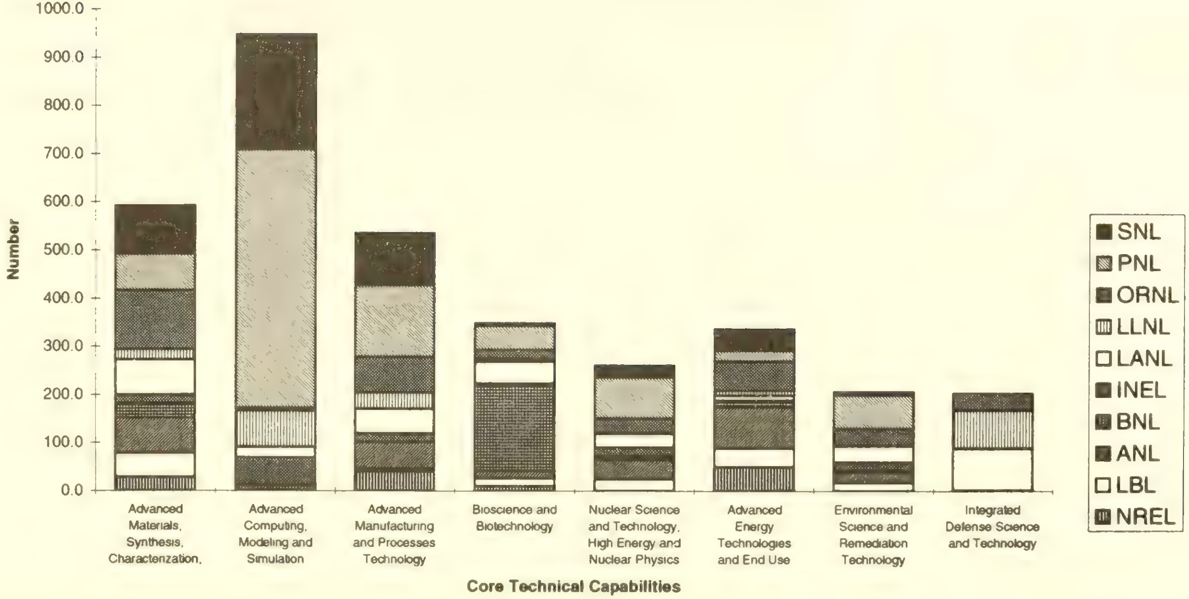
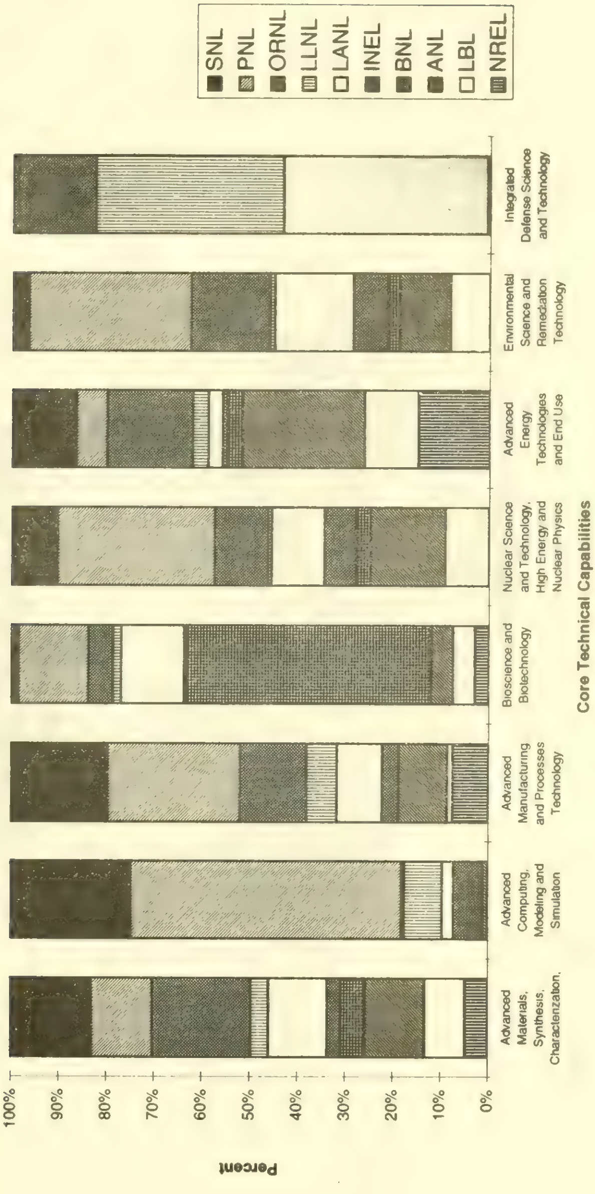
Patents and Licenses
(FY93)



Patents and Licenses
(FY93)



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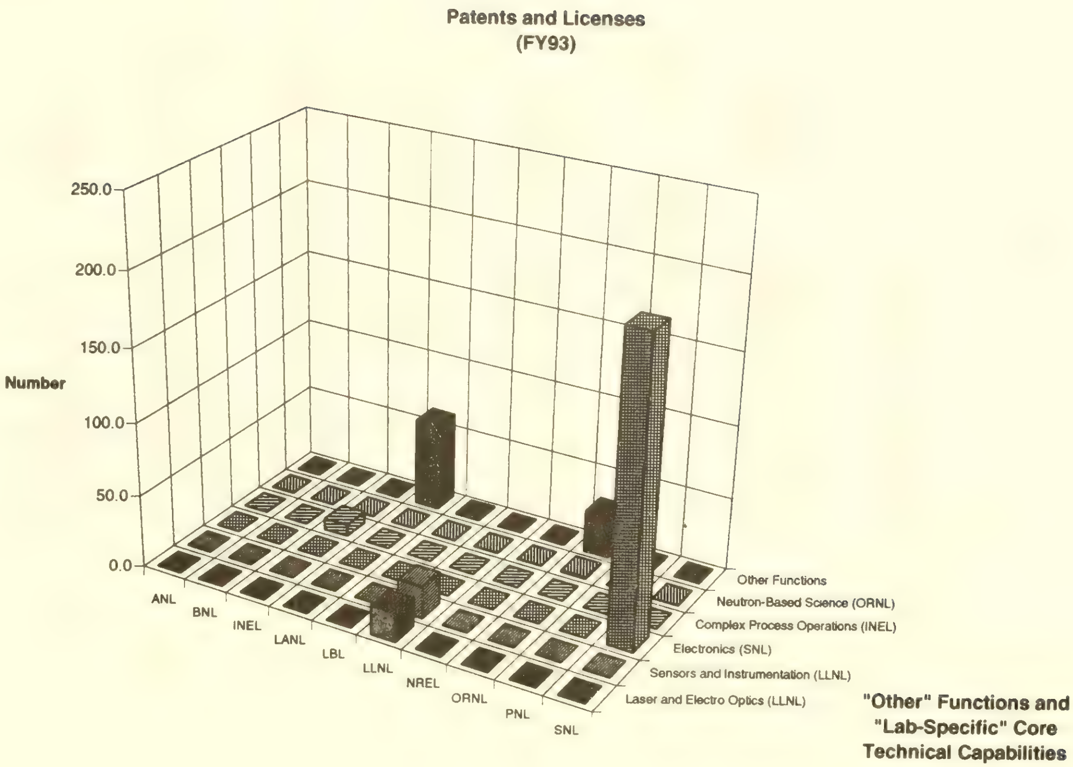
Patents and Licenses
(FY93)
Number
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100.0
50.0
0.0
ANL
BNL
INEL
LANL
LBL
LLNL
NREL
ORNL
PNL
SNL
Other Functions
Neutron-Based Science (ORNL)
Complex Process Operations (INEL)
Electronics (SNL)
Sensors and Instrumentation (LLNL)
Laser and Electro Optics (LLNL)
"Other" Functions and
"Lab-Specific" Core
Technical Capabilities

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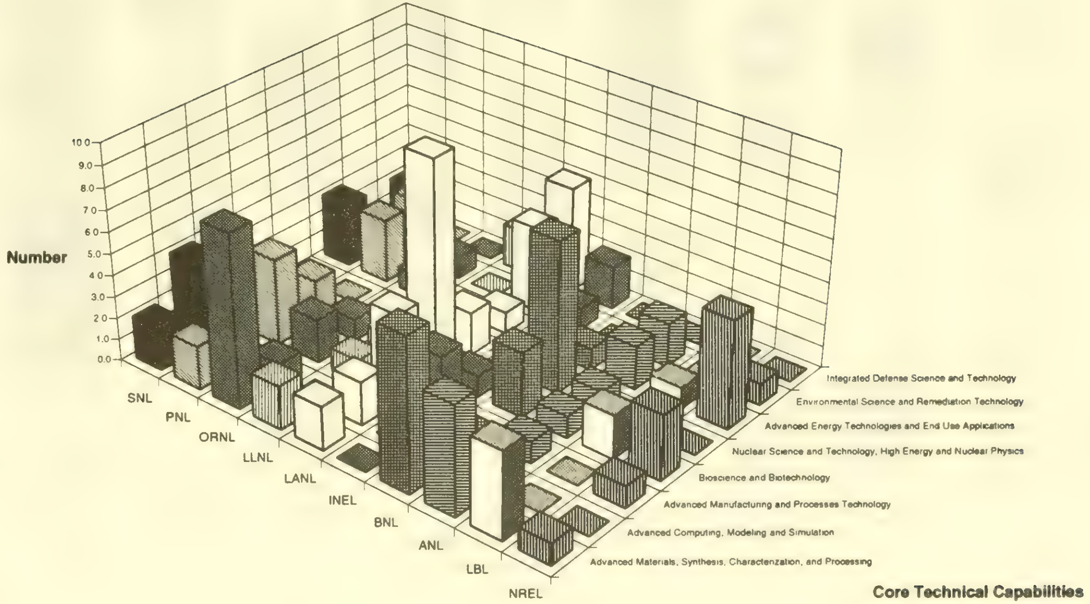
R&D 100 Awards
(FY89-93)



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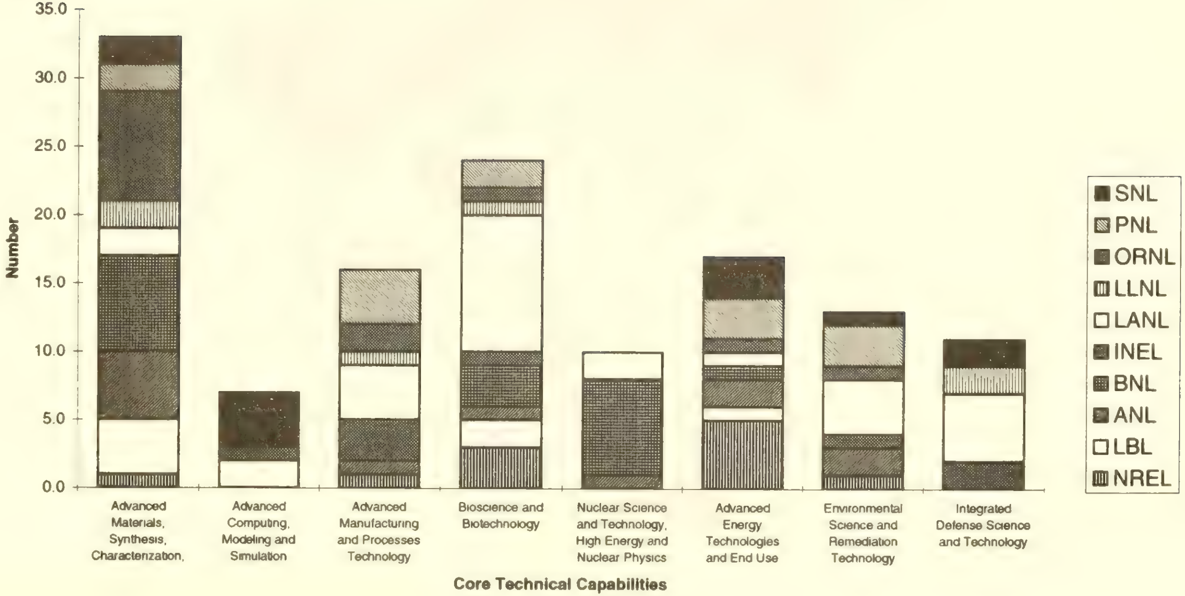
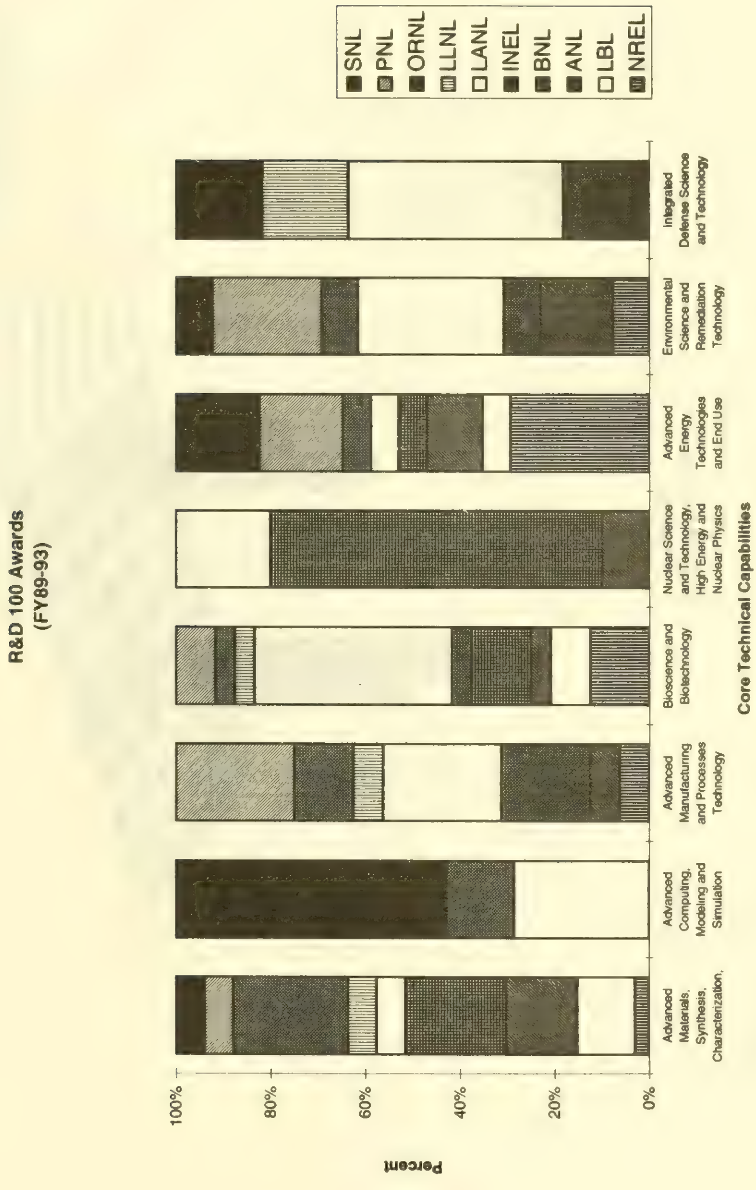
R&D 100 Awards
(FY89-93)





R&D 100 Awards
(FY89-93)

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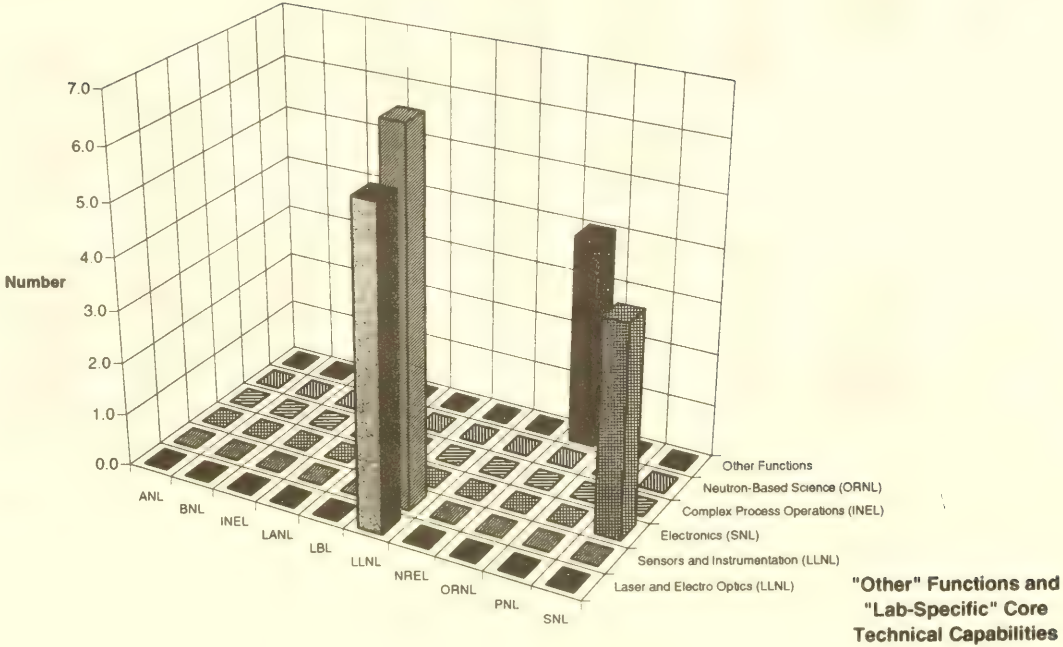
R&D 100 Awards
(FY89-93)



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